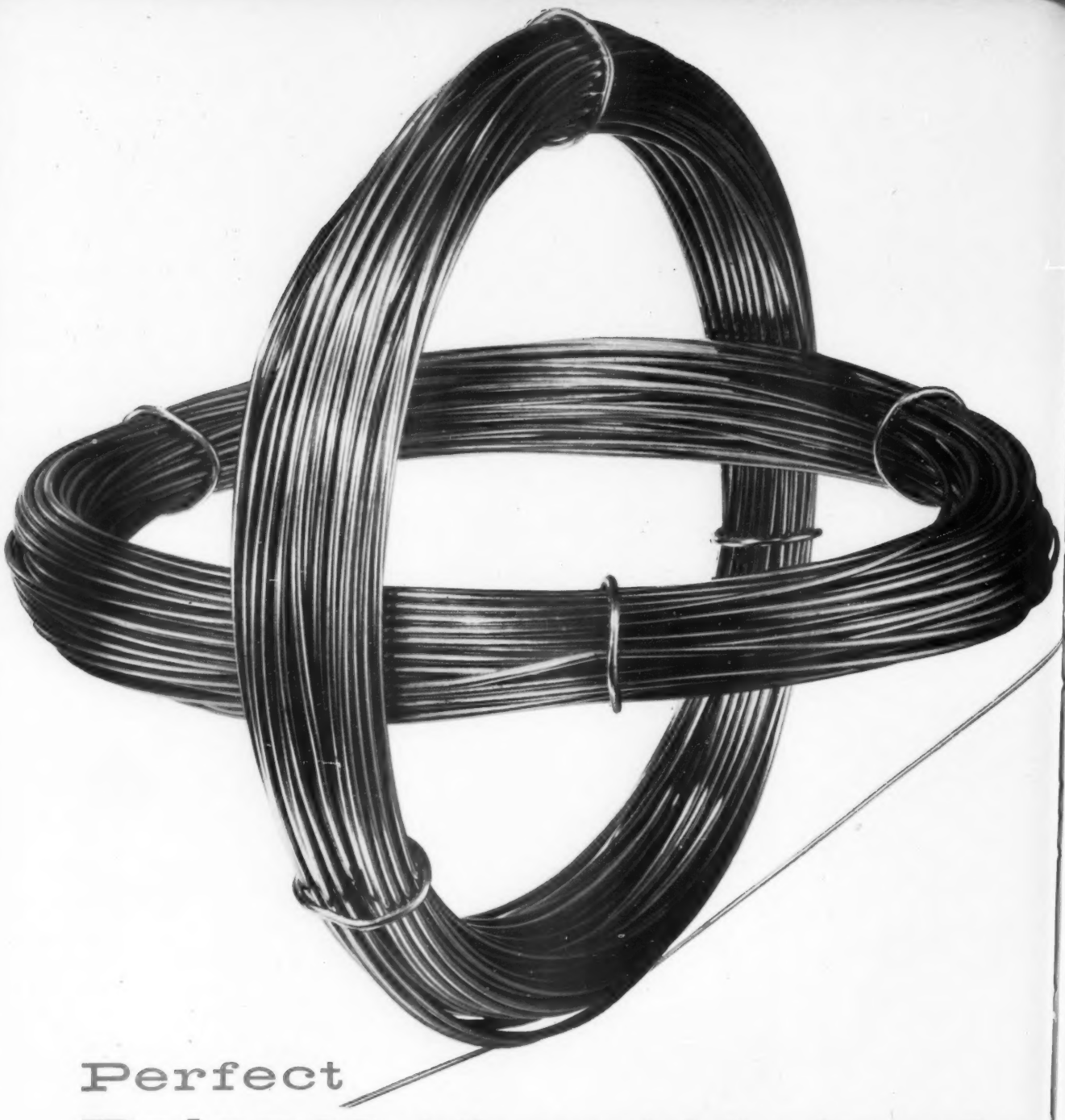
MORGAN-CONNOR
WIRE MACHINES



Perfect Balance— is the answer to better wire annealing

Heat balance—that's the answer whether you are annealing ferrous or non-ferrous wire. Lee Wilson's exclusive high convection furnace design eliminates hot and cold spots — assures balanced temperatures throughout the entire furnace. This means that every coil of wire or rod in the charge, whether it's at the top, middle or bottom of the spiders, gets the same amount of heat applied to the coil surfaces. Every coil comes from the furnace with exactly the same annealing treatment. This is one of the big reasons w more wire and rod are annealed in Wilson furnaces th in all others combined!

Lee Wilson* ENGINEERING COMPANY, INC.
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HIGH CONVECTION ANNEALING FURNACES
MAKE THE BEST METALS BETTER

*ORIGINATORS AND LEADING PRODUCERS OF HIGH CONVECTION ANNEALING FU

It's the "Know-How" that makes

"STANDARD INDUSTRIAL" synonymous with Top Quality and Good Mill Practice.

We are continually working toward the development of better products to add to the famous line of

"America's Finest Wire Drawing Lubricants"

We would like to help YOU solve your problems.

Write or telephone for a representative to call.

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Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.

Standard Industrial **COMPOUNDS CO., INC.**

FRANKFORT, ILLINOIS

(A suburban Chicago area city)

Telephones: 2131-2141

TRAMRAIL-EQUIPPED ROD STORAGE

CUTS HANDLING COSTS

This large structure was especially designed to accommodate a Cleveland Tramrail crane and hairpin-hook. It has enabled an impressive reduction in rod storage and handling costs. Size is 60'-0" x 160'-0". Crane runway is 200'-0" long. Height floor to roof truss is 35'-0". Storage capacity is 2500 tons.

The cost of storing and handling rod has been reduced to a very low figure at the Frost Steel and Wire Co., Ltd., Hamilton, Ont., with an open, roofless building which was built especially for the installation of a Cleveland Tramrail crane with hairpin-hook carrier.

The 160'-0" long structure is provided with unusual cantilever trusses for supporting the three archbeam tracks of the crane runway which extend 20'-0" beyond both ends of the building. These overhangs permit the crane to run over spur tracks of the Canadian Pacific Railroad at one end and the Canadian National Railway at the other end of the frame-work. Thus, rod can be lifted out of railroad cars and placed directly into storage.

On some days 8 cars of rod, or 400 tons, are brought in. The coils are piled eight high. At least double the amount of rod received must be handled, since the crane also has to move it out of storage. The work is taken care of completely by the operator in the crane cab.

The storage areas of many wire and rod plants, both large and small, are equipped with Tramrail systems for either horizontal or vertical coil storage.

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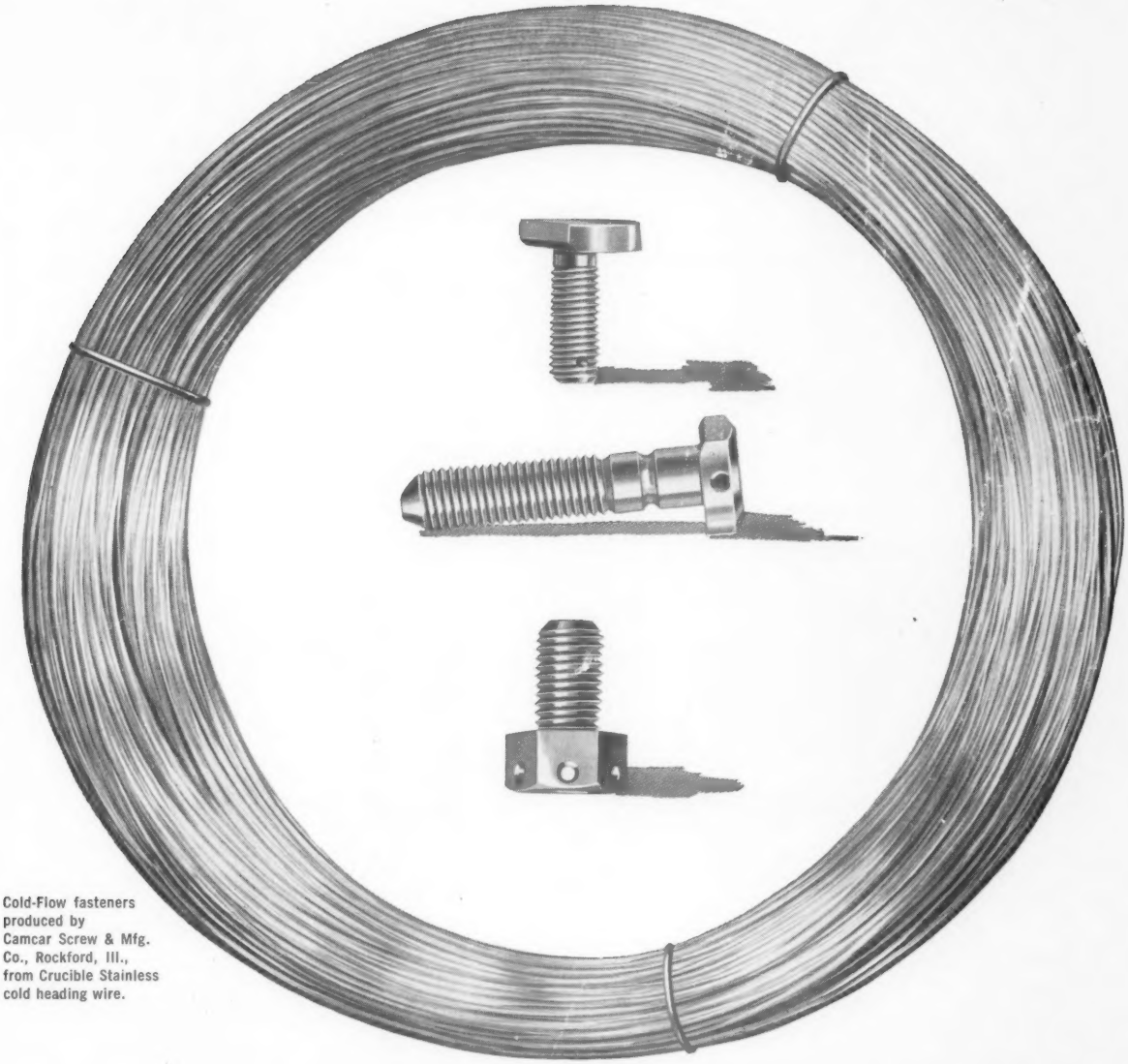
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9220 East 288th Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



Cold-Flow fasteners produced by Camcar Screw & Mfg. Co., Rockford, Ill., from Crucible Stainless cold heading wire.

fast delivery–wide selection on CRUCIBLE STAINLESS STEEL WIRE

Shipments are prompt on all standard types of Crucible stainless wire—including cold heading, spring, welding, and fine wires. And you have your choice of the widest assortment of grades, sizes and finishes.

You're sure, too, of stainless wire that is structurally sound and uniform in hardness, sufficiently ductile to make forming easy, and with proper physicals to meet your specifications.

Crucible has the right wire for your job. Your nearby Crucible representative will be glad to arrange for fast deliveries. Tell him your needs. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

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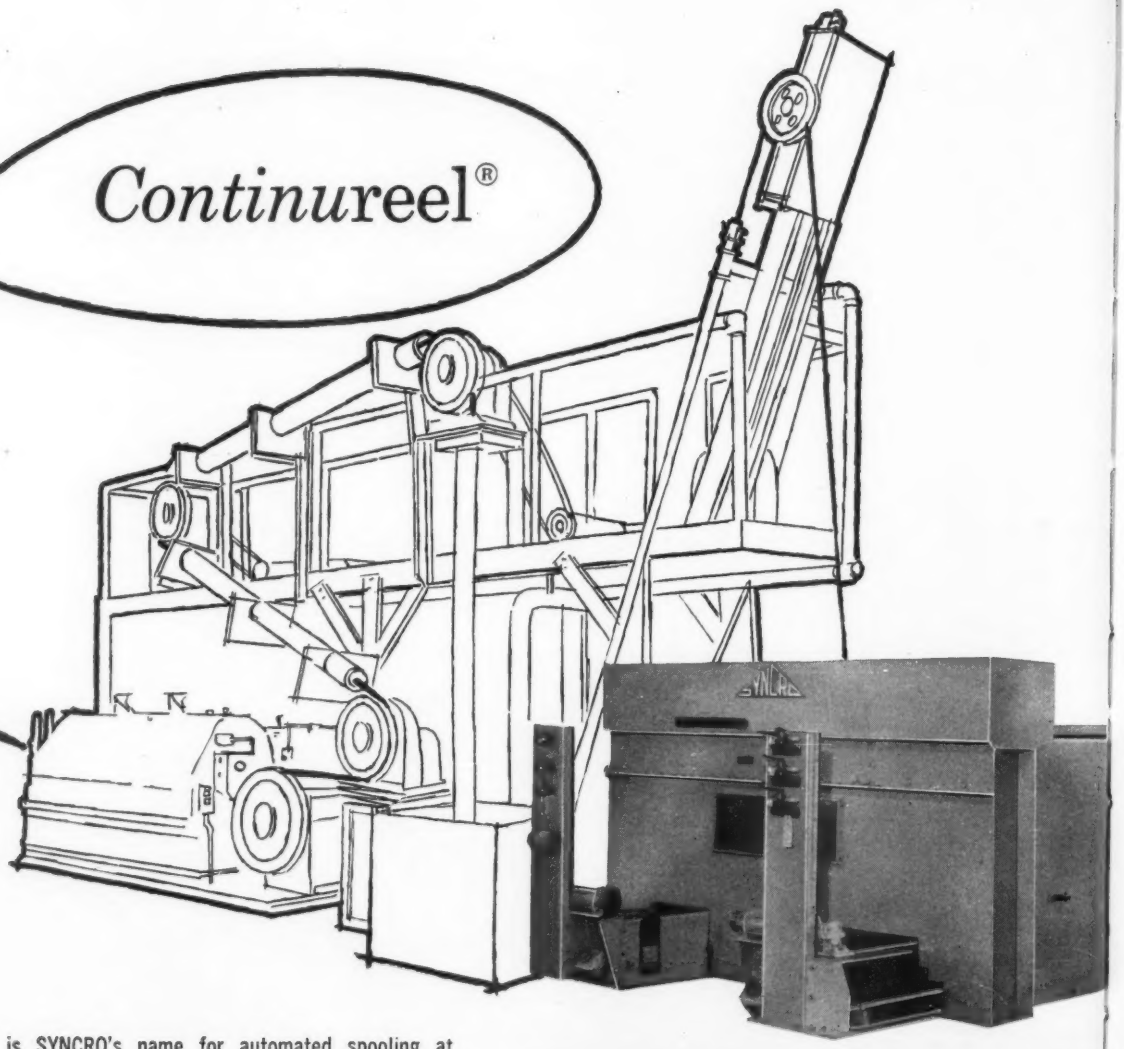
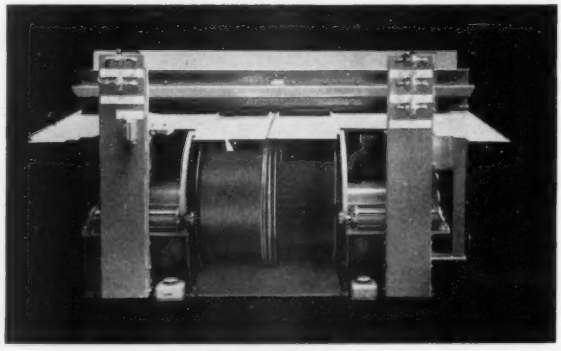
Continureel®



Continureel is SYNCRO's name for automated spooling at speeds up to 4000 F.P.M. for copper and 5000 F.P.M. for E.C. aluminum, without shutdowns or slowdowns.

Shown here, the **Continureel** is operating as part of SYNCRO's exclusive automated method of copper wire drawing, annealing and spooling in one continuous operation. **Continureel** may, however, be adaptable to your present machinery in your mill. Its superiority of performance in speedy spooling of wire up to #6 soft, and #8 hard copper is unmatched. Accommodates standard reels to 30″ in diameter.

Unquestionably, this is today's most practical spooling method — based upon the best cost-cutting features of automation.



Look first to SYNCRO today!

Continureel means

- No spool change-over shutdowns
- Successive starting shock loads eliminated
- Maximum speed and spool capacity
- Easier, Faster, Safer!

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affiliated company: WINGET SYNCRO Ltd. Rochester Kent, England

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WIRE DRAWING MACHINES • DIE STRINGERS • CONTINUOUS ELECTRIC ANNEALERS • PAYOFFS • CAPSTANS • WIRE INSULATORS • HEAVY DUTY TAKEUPS • TAPERS • SPECIAL MACHINERY

WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 32 June, 1957 No. 6

Designated as Official Publication By The Wire Association

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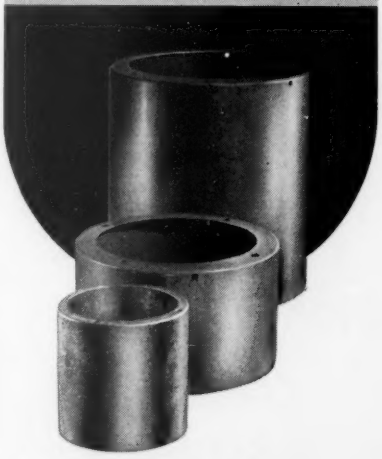
REPUBLIC PROVIDES FAST DELIVERY On Over 100 Sizes of

FLANGED STEEL TRAVERSES



Made as light as 18-gage steel in sizes from 12″ to 56″ in diameter and from 6″ to 48″ in length.

Plain, painted or hot dipped galvanized finish meets requirements for plain or coated wire and cable.

Republic Steel Traverses are lightweight, strong, durable, easy to assemble. Send coupon for details.

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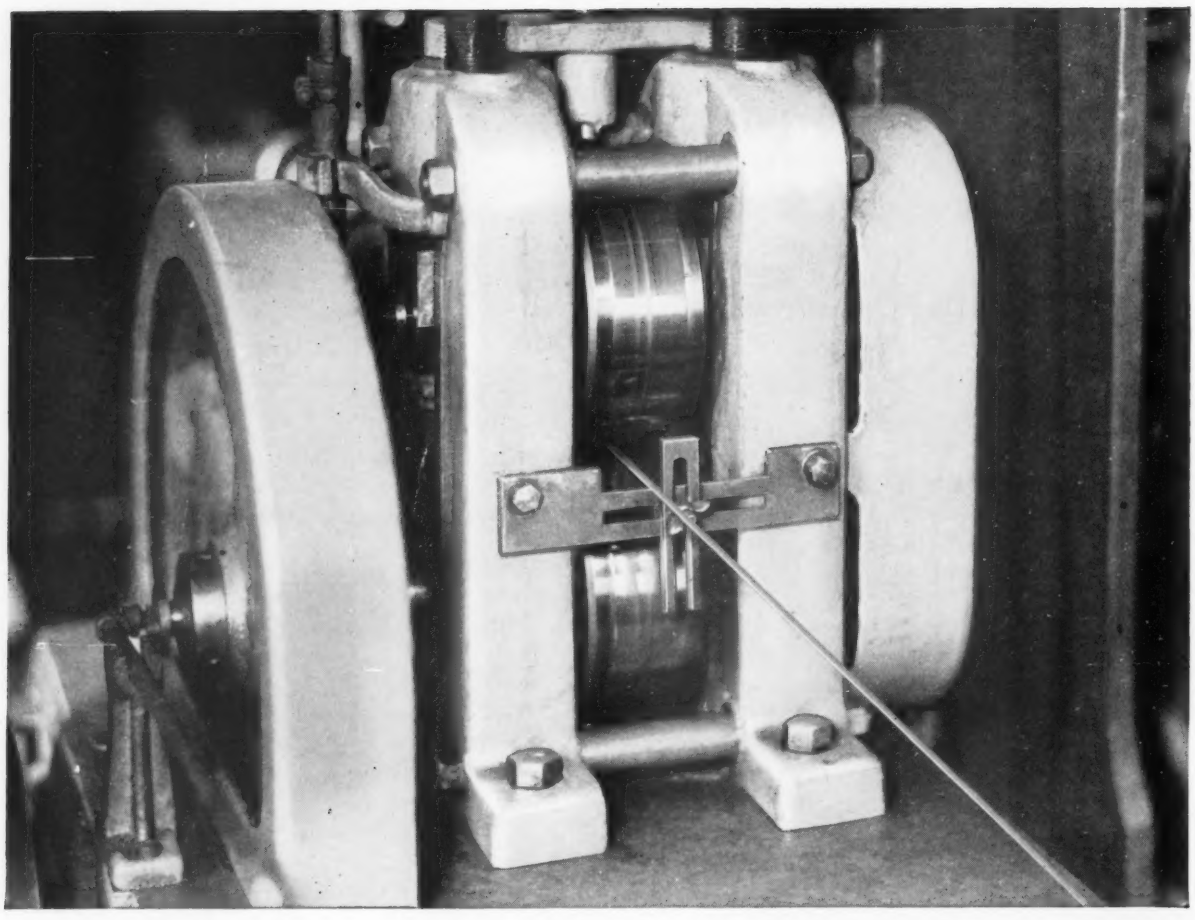

Flattening stainless-steel wire for loom reeds . . .

CARBOLOY FLAT-WIRE ROLLS USED 4 YEARS; 8 MORE YEARS POSSIBLE BEFORE REGRINDING

Every week for four years, three 65-lb. coils of stainless-steel wire for loom reeds were flattened by these Carboloy carbide rolls. Five passes were required to reduce the wire from .053″-.058″ diameter to an average thickness of .011″, in widths of .105″ and .125″.

In all, more than 200,000 lbs. of wire have passed through these rolls since 1953. Gowdy Reed Co., Providence, R. I., expects eight more years of service before they need regrinding—because only three of the possible nine rolling spots have been used. Wire thickness and width are still accurate; finish is still lustrous and polished.

Before they are reground, these Carboloy flat-wire rolls will have more than paid off the initial investment for Gowdy. After regrinding, these carbide rolls will continue to roll hundreds of thousands of pounds of precision flat wire.

Long life like this, with substantial reductions in downtime, maintenance, and manpower, are typical of the savings Carboloy cemented carbide rolls, dies, and other products are bringing to the wire industry.

Whether your business is flattening, drawing, extruding, or heading, you can gain similar benefits with Carboloy cemented carbide products. For more information, or in-plant technical assistance, write: *Metallurgical Products Department of General Electric Company, 11171 E. 8 Mile Ave., Detroit 32, Michigan.*

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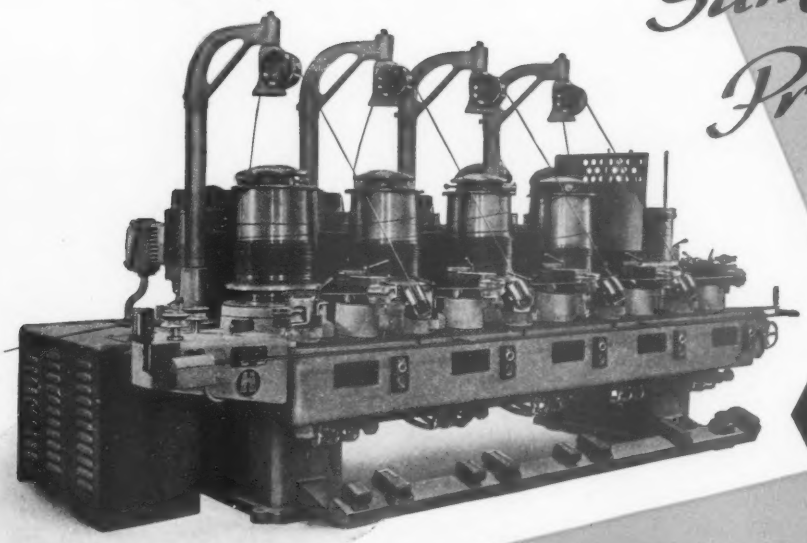
GENERAL ELECTRIC

HERBORN

Model G III
11 Drafts

Same Production, Half Space



Model G III d
5 Blocks =
10 Drafts

Your inquiries are kindly invited.

MASCHINENFABRIK HERBORN BERKENHOFF & DREBES A.-G.
OUR SPECIALITY: MACHINES FOR THE WIRE INDUSTRY · IRON FOUNDRY
HERBORN
(DILLKREIS) GERMANY

Got a wire problem?

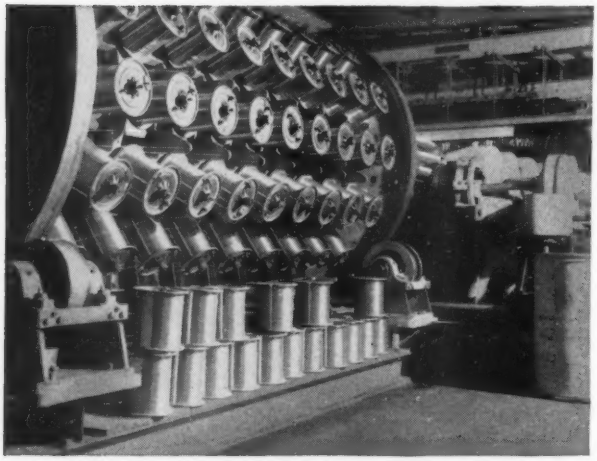
Commercial and industrial buildings must conform to an exacting set of fire and safety regulations. Glass areas are particularly troublesome because high winds and flying objects can fracture the glass and the fragments can slash a person to ribbons.

Fire can melt the glass and permit disastrous drafts that will fan a small blaze into a catastrophic fire.

For these reasons, critical glass areas must be made from wire-reinforced glass. You've seen the old-style "chicken netting" wire glass. It's durable and strong, but it hardly fits in with the sleek decor of a modern building. Mississippi Glass Company (world's largest manufacturer of rolled glass) designed a new wire reinforcement using a simple, *welded* netting wire. They asked American Steel & Wire, "Could it be made?"

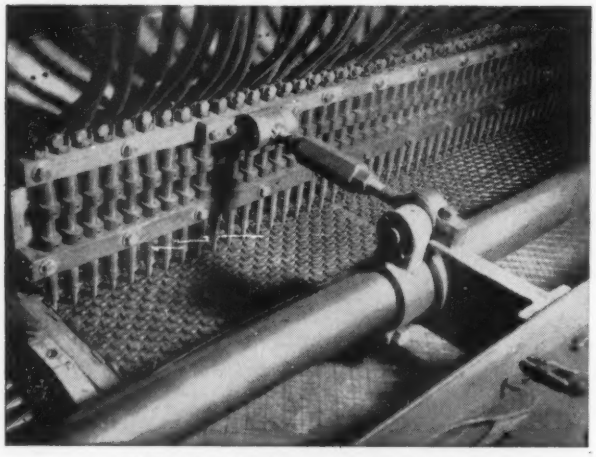
The wire had to be absolutely clean and free of dirt particles and moisture that would cause bubbles in the glass. Under these extreme cleanliness conditions, the wire had to be welded at every intersection, wire that was only .0204″ in diameter. Mississippi Glass Company designed a special machine, the only one of its kind in the world, that carries 127 spools of wire, weaves it into 66″-wide fabric, welds every joint, preserves the cleanliness and produces about two miles of netting every day.

So if *you* have a tricky wire problem, recall that American Steel & Wire knows how to do things with wire. And at the lowest possible cost. Just call your AS&W representative.

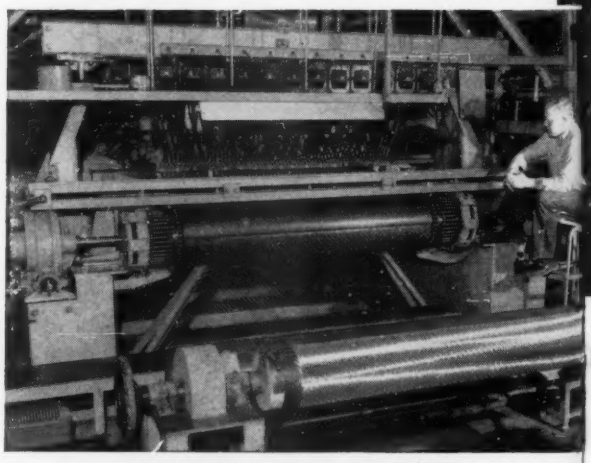


Spool end of the weaving machine. We produce a special-finish Annealed Glass Netting Wire for this use.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY NEW YORK

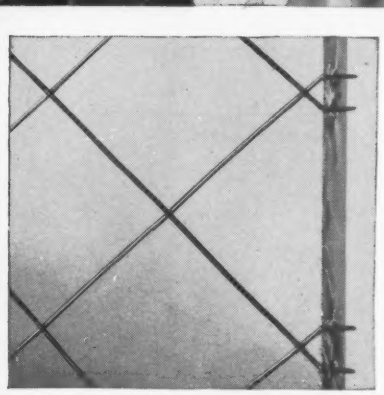


Welding the joints in the netting. This is a difficult operation, requiring very careful control.



Delivery end of netting machine. The 66″-wide rolls are made in lengths of 500 feet.

Look at this one!



This is the finished Polished Misco Wired Glass. Notice clean, simple appearance. Mesh is ¾-inch.

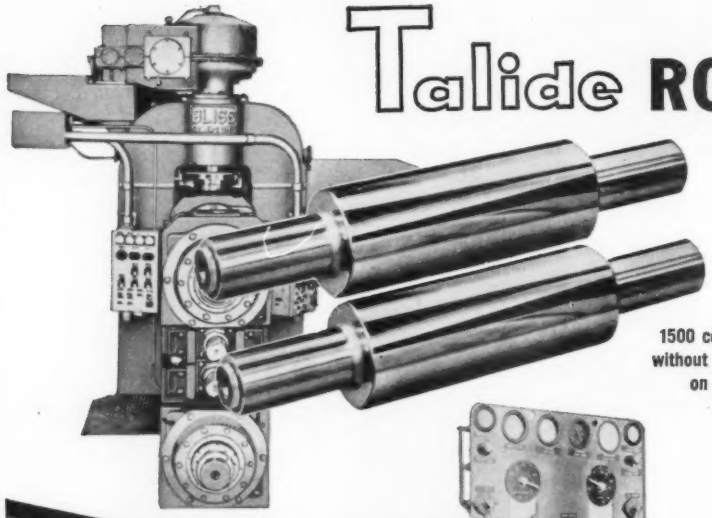
USS AMERICAN MANUFACTURERS WIRE

USS TRADE MARK

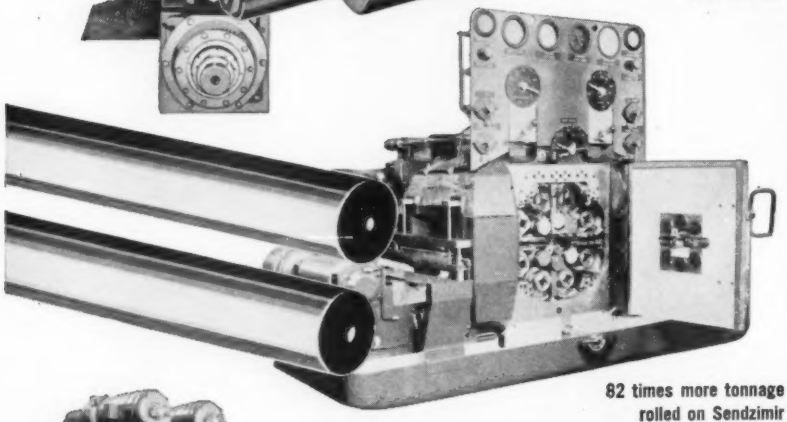
AMERFINE—*high-quality fine wire.*
AMERSPRING—*music steel spring wire.*
AMERTEMP—*heavy-duty oil-tempered wire.*
AMERLOY—*alloy heading wire.*
AMERHEAD—*uniform heading wire.*
AMERSTITCH—*extra-tough metal stitching wire.*

UNITED STATES STEEL

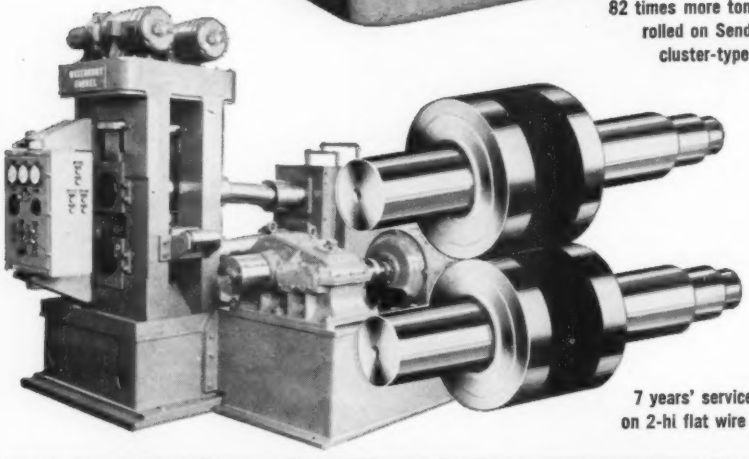
Talide ROLLS OUTLAST ALL OTHERS!



1500 coils rolled without a regrind on 4-hi mill.



82 times more tonnage rolled on Sendzimir cluster-type mill.



7 years' service life on 2-hi flat wire mill.

Talide rolls have proven far superior to both steel rolls and carbide rolls of any other make.

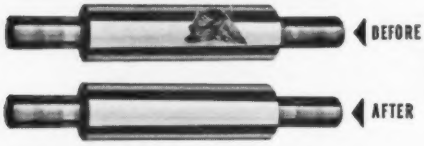
During the last five years Talide rolls have been adopted by every major strip steel producer. Metal Carbides pioneered and developed tungsten carbide rolls and successfully adapted them to all types of rolling mills including STECKEL, BLISS, UNITED, MESTA, STANAT, SENDZIMIR, WATERBURY-FARREL, TORRINGTON, RUESCH, FENN, WEAN, COLD METAL, etc.

Talide work rolls are ultra-hard, extremely dense and porous-free. Manufactured from highest purity tungsten carbide powders, the surface finish of a Talide roll is smoother than one microinch. Hard as a diamond, it will take a "bigger bite" than a steel roll. Strip steel of all analyses can be rolled down to thinner gauge, with more accuracy, greater reductions and with fewer anneals than possible with any other roll.

ONLY TALIDE WORK ROLLS GUARANTEE THESE ADVANTAGES

- ★ MORE PRODUCTION
- ★ BETTER FINISH
- ★ LONGER LIFE
- ★ HIGHER SPEEDS
- ★ CLOSER TOLERANCE
- ★ IMPROVED PHYSICALS
- ★ GREATER REDUCTION
- ★ LESS DOWN TIME
- ★ FEWER REJECTS
- ★ LESS MAINTENANCE

EXCLUSIVE REPAIR SERVICE



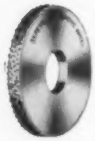
Broken or damaged carbide rolls can be re-worked to first class condition with all defects eliminated at one-half original cost. Only Metal Carbides offers this service—because of its exclusive hot press method.

Talide Rolls are made in lengths up to 100", diameters up to 25", and up to 5000 lbs. by weight.

Metal Carbides Corporation,
Youngstown 12, Ohio.

Send for new 76-page catalog 56-G

SUPERSET GRINDING WHEEL

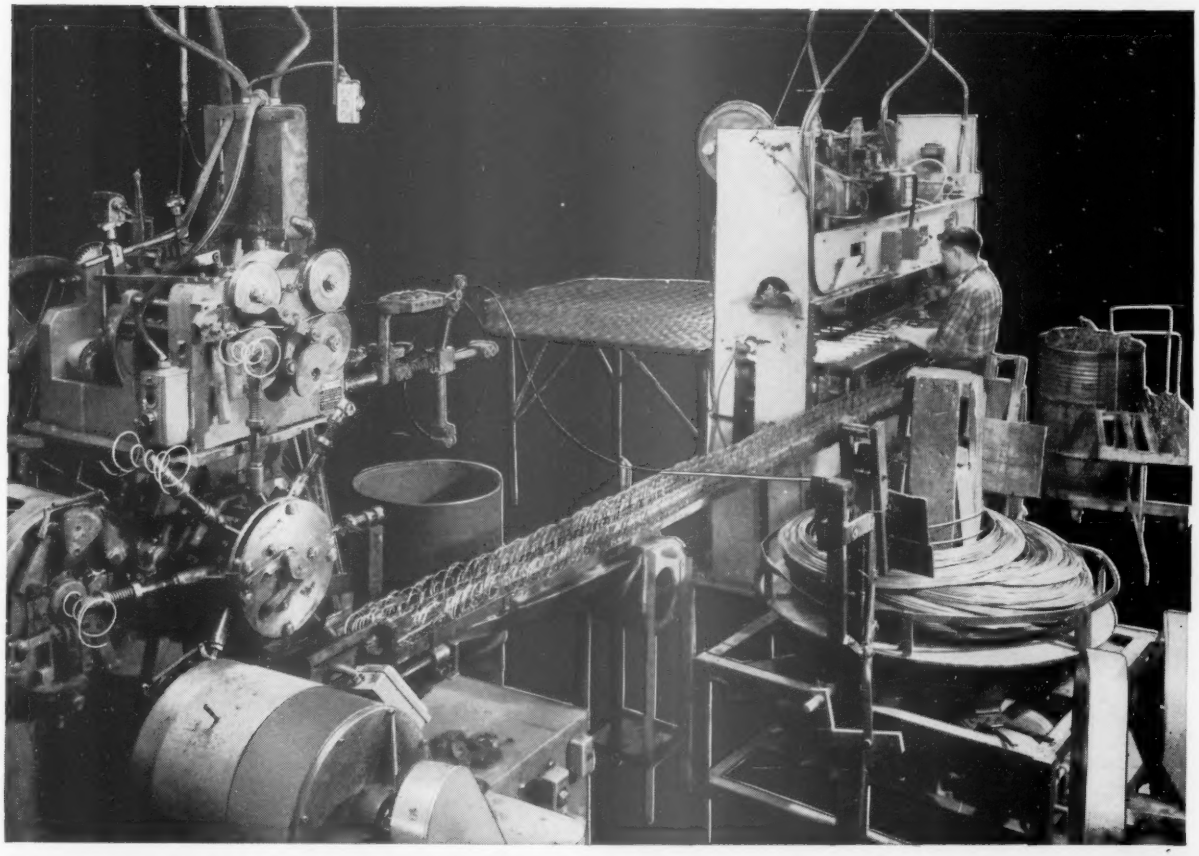


The Superset diamond grinding wheel was specially developed for grinding carbide rolls to highest possible surface finish and luster. Made of 4-8 micron size diamond dust, it imparts a surface finish far superior to any other commercial wheel. Available in sizes up to 25" diameter

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

Double cone springs are produced automatically on this Wunderlich special high speed automatic coiling and knotting machine at the Sealy Mattress Company, Cleveland, Ohio. Machine coils, crimps, knots and heat treats springs made from 13½ gage Mastercraft spring wire, supplied in 600 lb. bundles.



UNIFORMITY OF J&L WIRE

speeds spring production

J&L spring wire reduces number of rejects, increases production, in modern automatic operations. One reason is that every bundle of spring wire is produced to closely controlled tolerances.

Rigid quality control assures uniform physical and dimensional characteristics. Every coil of famous Mastercraft, hard-drawn MB or Electromatic oil-tempered MB spring wire is thoroughly tested.

Try this superior Jones & Laughlin spring wire. You'll find it's tops in quality, competitive in price.

Call your J&L representative or write to the Jones & Laughlin Steel Corporation, Dept. 448, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

Jones & Laughlin STEEL ... a great name in steel

PROPERTIES OF KENNAMETAL DIE GRADES

Grade	Hardness (Rockwell A)	Transverse Rupture psi	Young's Modulus of Elasticity psi	Compressive Strength psi	Suggested Applications
K82 K84 K86	90.0 91.0 91.5	275,000 300,000 250,000	65,500,000 74,000,000 72,000,000	663,000 600,000 590,000	Draw dies (all sizes) for drawing tubes, bars and wire; for cupping and deep drawing.
K90	85.0	360,000	61,600,000	518,000	Heavy blanking dies up to 3/16" steel. Dies for cold-heading, nail gripping, nibbling, swaging steel rods, heavy curling, coining.
K91	86.5	380,000	64,400,000	540,000	Light-heavy blanking up to 1/16" steel; rivet sets, crushing hammers, washers, dies.
K92	87.5	385,000	71,900,000	572,000	Lamination dies on .004" to .035' silicon steel; medium blanking dies softer metals up to .040"; heavy forming dies; heavy heading machine hammers; hardware curling dies.
K94	90.0	325,000	77,900,000	600,000	Tube swaging dies; light blanking up to .020" silicon steel; medium blanking, softer metals up to .040"; heavy forging dies; heavy heading machine hammers; curling dies for hardware.
K95	90.5	300,000	82,000,000	644,000	Light blanking up to .015" silicon steel; light heading hammers; wear-resistant parts.
K96	92.0	250,000	94,300,000	800,000	Dies for asphalt floor tile; slate-covered asbestos shingles; abrasive-covered roofing papers; and in the paper industry for slitter knives and plates; blanking and pressing dies; compacting dies for powder metallurgy, wear-resistant parts.

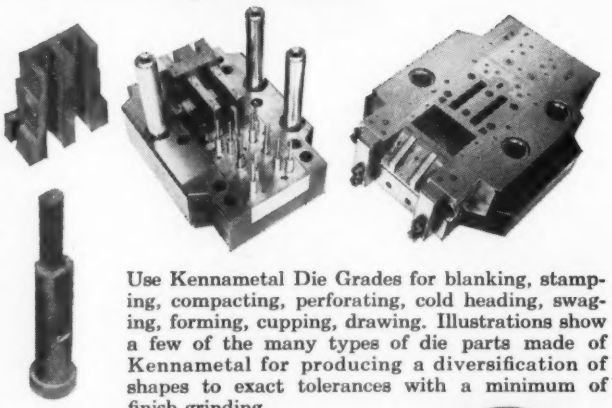
You can select the right grade of Kennametal* for each specific die requirement

With six grades in the "90 series" and three grades in the "80 series," Kennametal offers the right grade for any die application. The 90 series covers the full range of tungsten carbide grade requirements—from K90 with exceptional strength for heavy operations to K96 with maximum resistance to wear for such jobs as compacting and cutting highly abrasive materials.

In the 80 series, Kennametal offers three exclusive grades with unique properties not found in any other carbide. These three $WTiC_2$ grades, with a special slippery quality, have been created especially for drawing, forming and sizing operations where the slightest amount of galling or pickup cannot be tolerated.

From these two groups you can select the right grade for each specific job to assure highest production rates, to reduce die cost and maintenance, and provide products of uniformly accurate dimension and finish. Kennametal die engineers will gladly work with you in analyzing your die operations. They can show you performance reports on Kennametal over a wide range of applications—many of which may be similar to your operations. Call your nearest Kennametal office or write us direct. If you wish more information, send for Booklet B-100 and a copy of our new die grade selection chart. Kennametal Inc., Latrobe, Pa.

*Trademark



Use Kennametal Die Grades for blanking, stamping, compacting, perforating, cold heading, swaging, forming, cupping, drawing. Illustrations show a few of the many types of die parts made of Kennametal for producing a diversification of shapes to exact tolerances with a minimum of finish grinding.

7299

MINING, METAL AND WOODWORKING TOOLS

WEAR AND HEAT-RESISTANT PARTS

INDUSTRY AND KENNAMETAL ...Partners in Progress

ABRASION, CORROSION-RESISTANT PARTS

PERCUSSION AND IMPACT PARTS

THE BEELINE WIRE DRAWING MACHINE

Straight-line type Wire Drawing Machine for high production of all wire grades

This picture shows a Beeline DG 4, built for an inlet wire diameter of about 7 mm (.28 inch). High carbon steel.

Prominent Beeline features:

- Complete absence of slipping between wire and block.
- Direct block-to-block wire running, with automatic speed control and no loops or other mechanical adjusting devices.
- Continuous speed adjustment from almost zero up to maximum.

Let us help you solve your problems. We shall be glad to answer your questions promptly. Don't forget to let us know what wire is to be drawn, the inlet and finished diameter, its intended use, the production required, and all other relevant information (tensile strength of the finished wire etc.). Then we can suggest a machine that is just right for you.

The machine is at present manufactured in three different sizes:

BEELINE DG 5
for heavy wire, about 13 mm. (.500 inch)

BEELINE DG 4
for wire rods, about 7 mm. (.28 inch)

BEELINE DM 3
for wire with an inlet dia: wire of about 3 mm. (.116 inch)

MORGÅRDSHAMMAR

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A foursome holes out on the 4th green at Inverness. The bethanized chain-link fence was made and erected by Marleau-Hercules Fence Co., Toledo.

Inverness Club, host for USGA Open, chooses bethanized fence

Top golfers will compete for the coveted USGA Open crown on the scenic and challenging links at the Inverness Club near Toledo, Ohio. Getting ready for the tournament, to be held June 13 to 15, was a big task for the club management.

One of their first steps last fall was to enclose several long stretches of the club boundary. They wanted a fence that would be both attractive and long-lasting — two good reasons for choosing fence made from bethanized wire.

Bethanized wire is used for much of the chain-link fence sold today. Its uniform coating of pure zinc is deposited electrolytically on the steel wire. It goes on atom by atom. There are no thin spots. Long after other types of fence have become unsightly, bethanized fence stays bright because the tightly bonded jacket of zinc just won't crack or flake off.

Fence erectors like bethanized fence because the wires are smooth, with no sharp or rough spots to slash fingers. And at playgrounds and swimming pools there is no danger of torn clothing or injury when people crowd against the fence.

Bethanized wire is ideal for twisted wire brushes, conveyor belts, chain, and many other products that are severely formed. The zinc is highly ductile because in our unique process the zinc deposited is 99.9-pct-pure. We can supply this popular wire in hard or soft temper, with light or heavy zinc coatings. Our nearest sales office will gladly arrange to ship you a trial order.

Fence made from bethanized wire stays strong and bright. Its uniform coating of electrolytic zinc is tightly bonded to the steel for long service.

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On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
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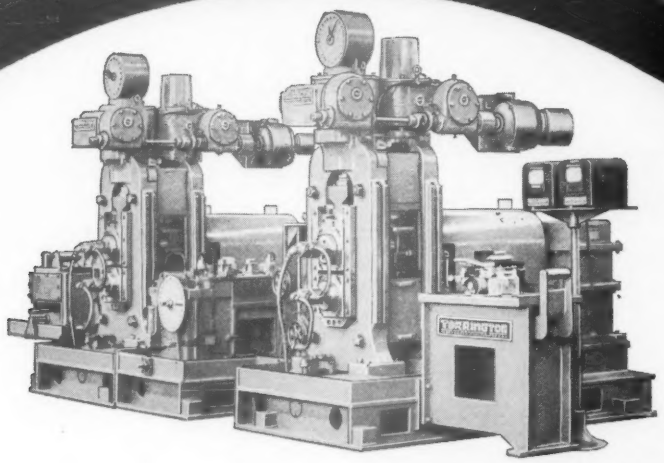
YOU CAN LOWER WIRE ROLLING COSTS



...with a Torrington Flat Wire Mill

SPEEDED PRODUCTION — Torrington Flat Wire Mills achieve finishing speeds up to 3500 FPM.

GREATER ACCURACY — Processed wire can be held to tolerances of .00025" in thickness and .0005" in width. Automatic magnetic gauges eliminate waste.

FLEXIBILITY — Combination of two or three flattening stands, with edgers, can accommodate wide variety of work.

DEPENDABILITY — Torrington machines are ruggedly built for years of repair-free service. Easy access to flattening rolls and other major components greatly reduces down-time for maintenance, adjustment and threading.

COMPLETE ENGINEERING SERVICE — Auxiliary mill machinery should be selected only after thorough consultation with experienced engineers. Torrington's engineering staff, backed by the knowledge and skill gained while serving the metal mills for nearly 70 years, will work with you to provide machinery best fitted to your needs. For full information, call or write: Mill Machinery Division, Torrington Manufacturing Company, Torrington, Conn.

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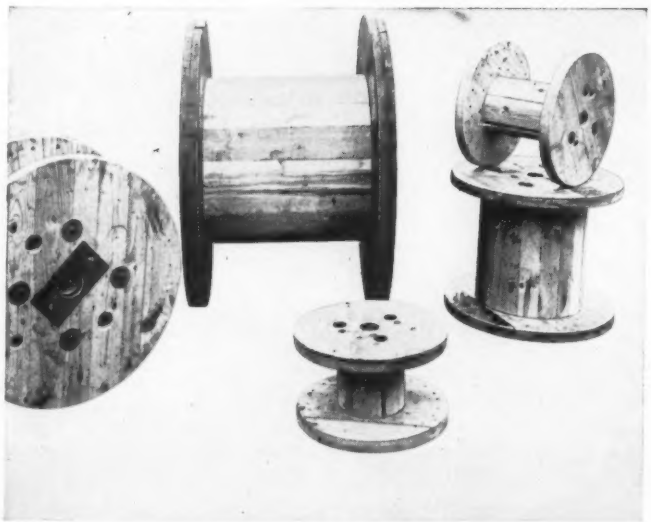

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- *No Repair Costs*
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Let us quote on your reel needs. Send your specifications. Better yet, visit our plant and see how and why our reels are made so well at so low a cost.

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YOU MIGHT AS WELL try to count the beans in a carload as the number of parts that are made of Roebling High Carbon Specialties, Flat Wire and Spring Steel. These Roebling products are unsurpassed for mechanical and dimensional uniformity . . . for speeding manufacturers' production and cutting costs.

Next time you order cold rolled high carbon wire or spring steel specify Roebling. Strictly on its performance you'll probably become a steady customer from then on. John A. Roebling's Sons Corporation, Trenton 2, N. J.

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EXTRUSIONS HANDLED WITH CARE BY LIGHT DUTY CATERPILLAR CAPSTAN

Davis-Standard Model LDC
Light Duty Caterpillar
Capstan

The outstanding ability of the Light Duty Caterpillar Capstan to maintain a constant straight-line pull with uniform gripping pressure distributed over a two foot length makes it a "natural" for plastic pipe and soft extruded materials. Gripping pressure is furnished by an infinitely adjustable air cylinder with a capacity of up to 80 psi.

Here is the ideal traction unit for plastic pipe from 3/8 to 6 inches in diameter and cable diameters in proportion to the pull required. With easily controlled pulling power from near zero to approximately 400 pounds maximum, the D-S Light Duty Caterpillar Capstan hauls off pipe at 50 or 100 fpm and cable up to 500 or more fpm depending on the pull required.

Cog-tooth belts driven by sprocketed wheels eliminate drive slippage. Belts are available with thick sponge-neoprene or polyurethane surfaces as optional equipment for handling fragile materials such as uncured rubber.

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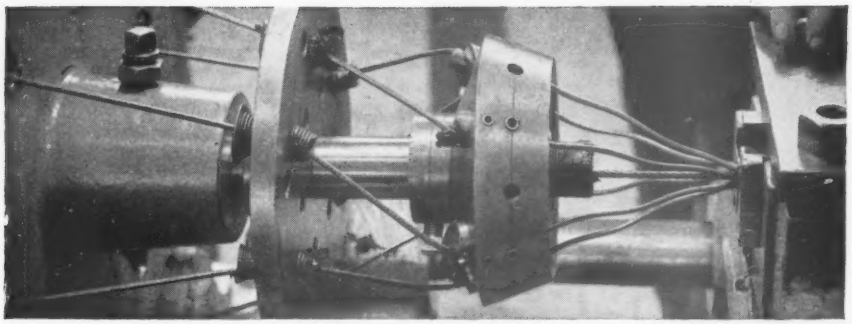


Close-up view of preforming Lang Lay rope by the quill head method in Upson-Walton's Cleveland plant. Stranded wires are threaded through a guide-plate to the quills for preforming of strands prior to entering the closing dies.

YOUNGSTOWN "YOLECTRO" ROPE WIRE

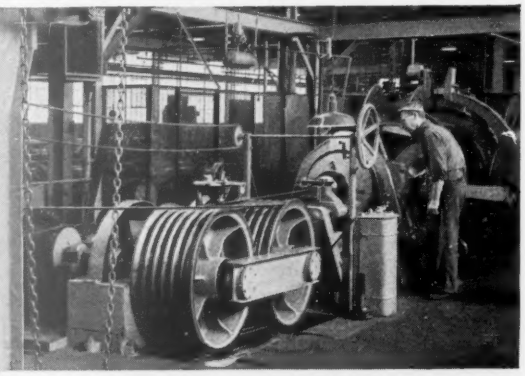
. . . builds strength and safety into UPSON-WALTON *wire rope*

Strength and safety are qualities characteristic of Upson-Walton's complete line of wire rope and rope fittings. For nearly 86 years this progressive Cleveland manufacturer has kept their product quality at the highest possible level.

Playing an important part in the Upson-Walton story is Youngstown "Yolectro" High Carbon Rope Wire. It's the basic material used to fabricate their various grades of wire rope. "Yolectro" Rope Wire's high degree of strength, toughness, abrasion resistance, gage uniformity and proper flexibility all contribute to the quality associated with Upson-Walton products.

"Yolectro" Rope Wire is closely quality-controlled throughout all its production operations from iron ore mining to final drawing and coating. This guarantees the desired balance of properties to meet your most exacting requirements. Why not make "Yolectro" your permanent specification for quality production? It's available with either a Bright or Galvanized finish in all AISI high carbon grades.

Metallurgical assistance or additional information is available from your nearest Youngstown District Sales Office. Why not write or phone them today?



Upson-Walton's 32" closer is capable of closing wire rope up to 1⅜" in diameter of six-strand construction. Bobbins of stranded wire are loaded into the cradles of the machine and guided to the preforming head and closing dies where it is closed into finished wire rope. Finished wire rope consists of stranded wire from 7 to 41 wires per strand closed around a fibre or steel core, depending upon customer requirements and applications.

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Manufacturers of Carbon, Alloy and Yoloy Steel

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900 Wire Nails
per minute
can be made on
our N/25 machine.

The "N" models are a line of fast, high-production nail forming machines that are made in 6 different sizes.

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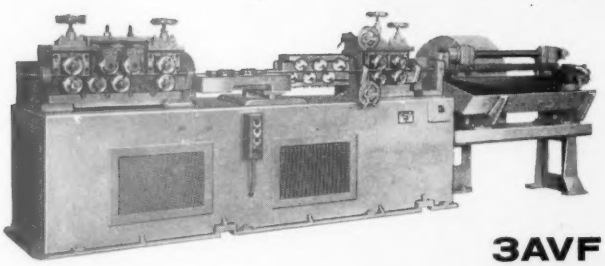

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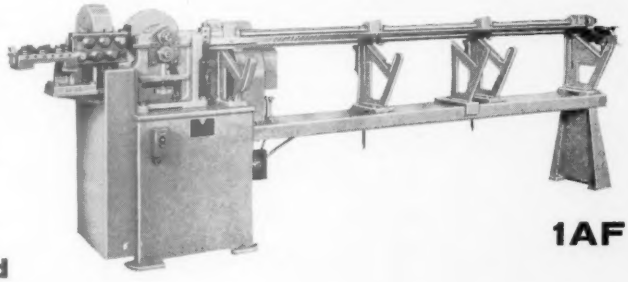

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Look at this range of Shape Stock Straighteners!

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1AF	Geared to feed 150 FPM.	1/8"	1/4"
1AVF	Geared to feed 50-200 FPM.	1/8"	1/4"
2AF	Geared to feed 125 FPM.	3/16"	3/8"
2ABF	Geared to feed 120 FPM.	1/4"	1/2"
3AVF	Geared to feed 76-228 FPM.	3/8"	3/4"

Send for complete literature, today!

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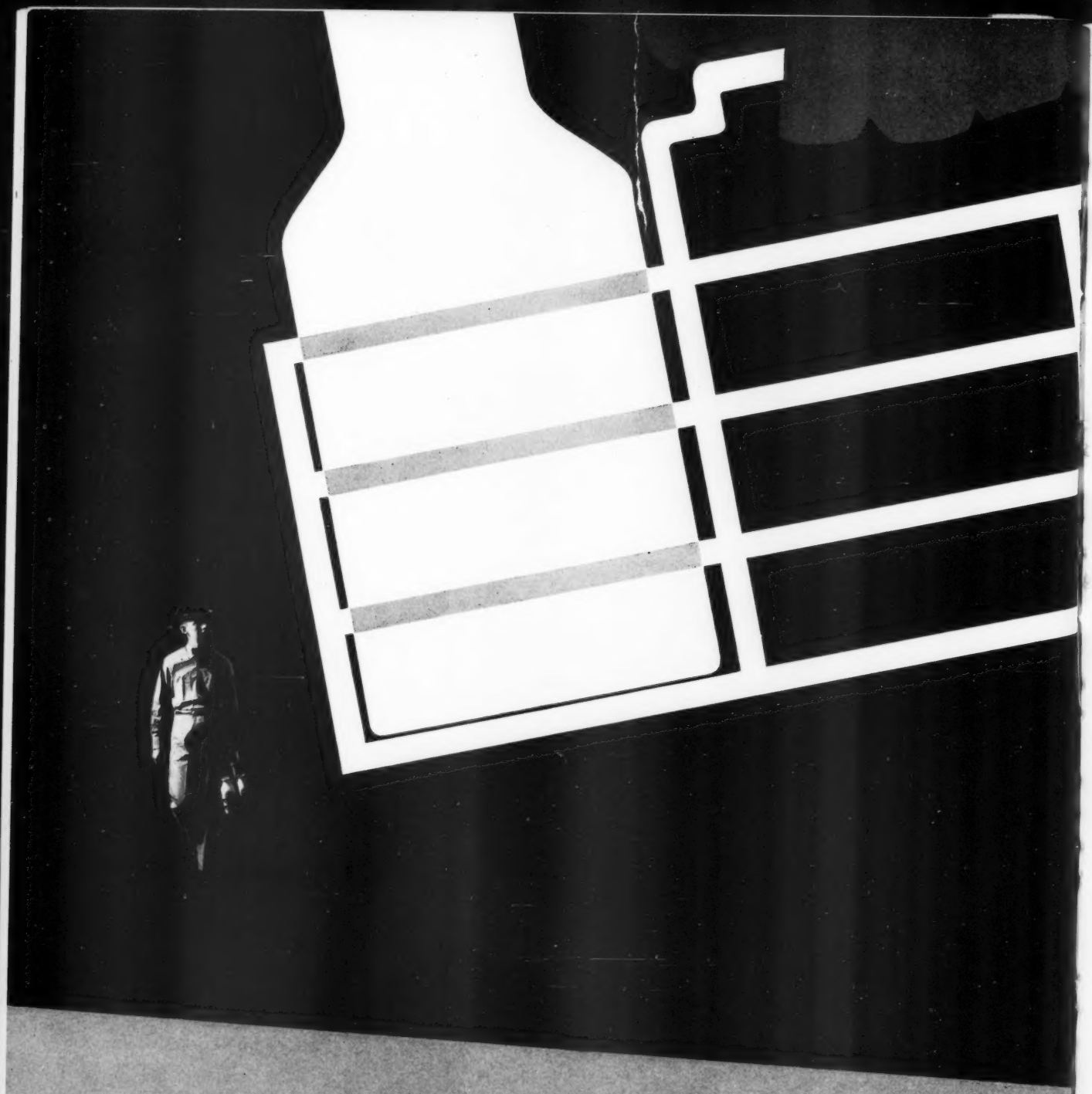

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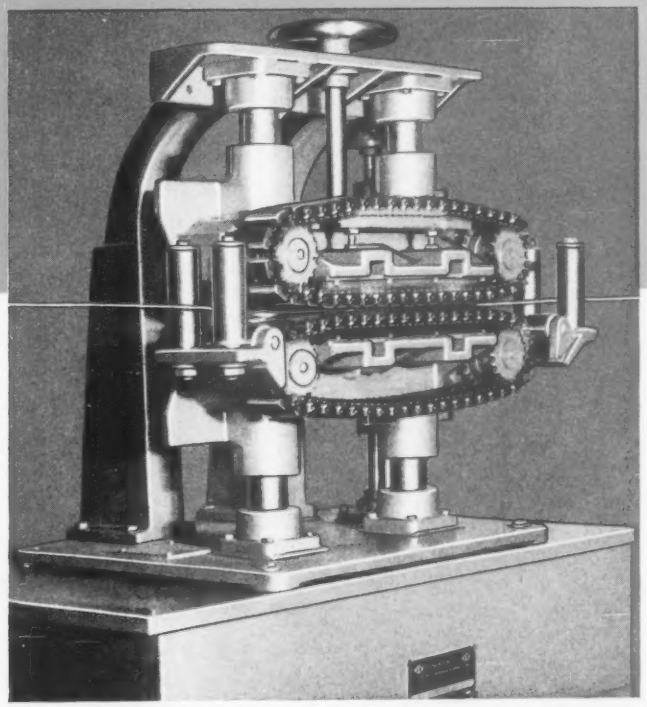
Cut Cable Damage to a Minimum



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PULLS CABLE STRAIGHT WITHOUT BENDING OR DAMAGING WIRE SURFACE

The most improved method of pulling cable through extruders, cablers and strander machines is with an Entwistle Caterpuller. The compact size, low maintenance costs and damage-free tendency of the Entwistle unit makes the Capstan method of pulling cable obsolete. Exacting horizontal pull is applied to the wire as it passes between the two belts of rubber gripping treads. Caterpullers are available in three sizes. Each Caterpuller is designed and built to individual specifications and pulling requirements. A minimum amount of floor space is needed for installation. Maintenance costs are very small compared to other pulling units.

Investigate how you can step up your plant production, reduce cable damage and cut maintenance costs. Write today for details.

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Vertical Caterpuller

Traction Length	20 inches
Maximum Cable Size	3 inches
Minimum Cable Size	3/16 inch
Pulling Force	700 lbs.*

CLASS C TYPE C
Vertical Caterpuller

Traction Length	40 inches
Maximum Cable Size	6 inches
Minimum Cable Size	3/16 inch
Pulling Force	6600 lbs.*

CLASS C TYPE CHA
Horizontal Caterpuller

Traction Length	40 inches
Maximum Cable Size	6 inches
Minimum Cable Size	3/16 inch
Pulling Force	6600 lbs.*

**Will vary with speeds and type of drive.*

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THE FULLY AUTOMATIC

SCHUMAG 4 in 1

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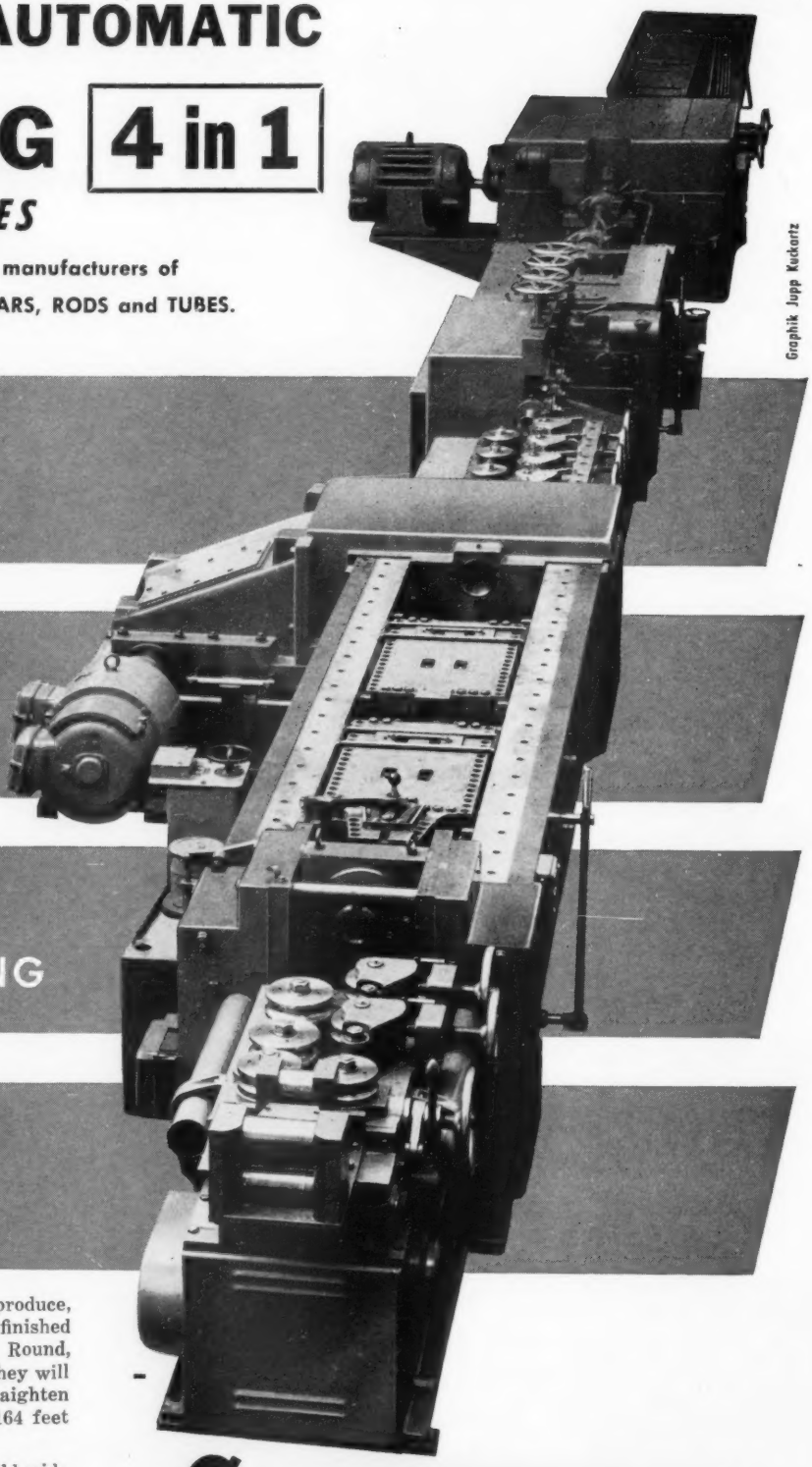
Greatest efficiency for manufacturers of
Ferrous and Non-Ferrous BARS, RODS and TUBES.



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- SCHUMAG "4 in 1" machines produce, **in one continuous operation,** finished Bars, Rods and Tubes from Round, Square or Hexagon material. They will Finish draw, Cut-to length, Straighten and Polish at speeds from 92-164 feet per minute.
- SCHUMAG "4 in 1" enjoys world-wide reputation as the **ultimate** in technical development.

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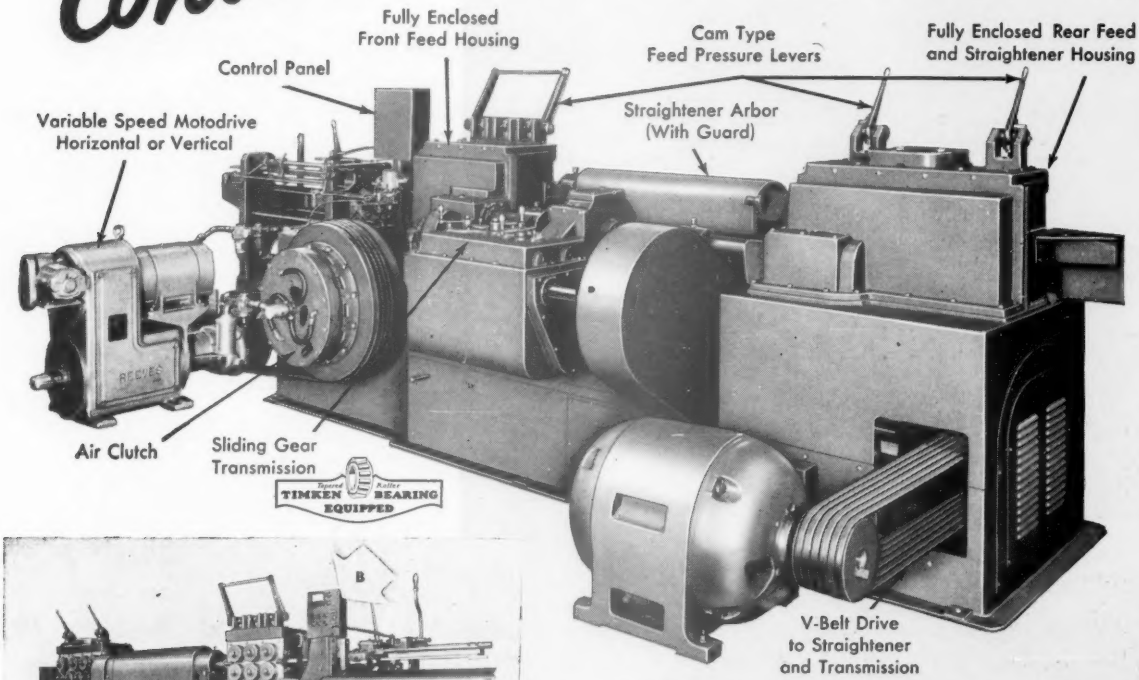
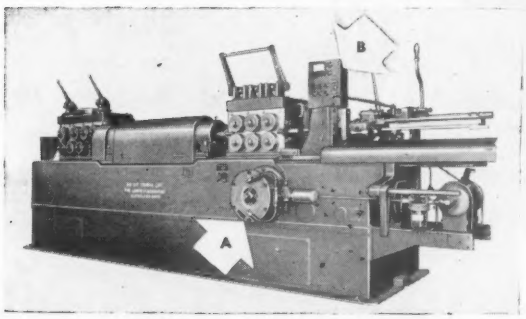
Better Quality Control

LEWIS

introduces the Air Clutch
[illegible] wire straightening
and cutting machines



No. 11-F Travel-Cut with Flying-Shear Cut-off. Capacity ½" to ¾" diameter. 75-135 feet per minute. Rear view (above) with guards removed showing air clutch and drive.



Front view of No. 11-F Travel-Cut with Flying Shear Cut-off showing Air Brake "A" (with guard removed) and operating panel "B" with push-button controls for Air Clutch, Reeves Motodrive and flywheel speed Indicator Tachometer.

● Lewis engineers have added three important improvements to their famous Travel-Cut Machines for BETTER QUALITY CONTROL . . . These machines are already in service in America's leading steel and wire mills.

Wichita Air Clutch permits higher cut-off speeds, eliminates shock of conventional clutch. No adjustment necessary . . . automatically compensates for wear.

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Reeves Variable Speed Motodrive permits infinite adjustment of flywheel speed for perfect synchronization of the cut-off and wire feed speeds. This unique arrangement makes possible the cutting of rod WITHOUT SPOT SWELL . . . allows finer adjustment for cutting short lengths. Dial tachometer registers flywheel speed.

There are Standard Lewis Travel-Cut or Stationary-Cut Machines designed to straighten and cut all materials and shapes in wire or rod from .012" to ¾" at a wide range of feed speeds.

Air Clutch available on all Travel-Cut Models. Send for new brochure showing complete line of Lewis Wire Straightening and Cutting Machines.

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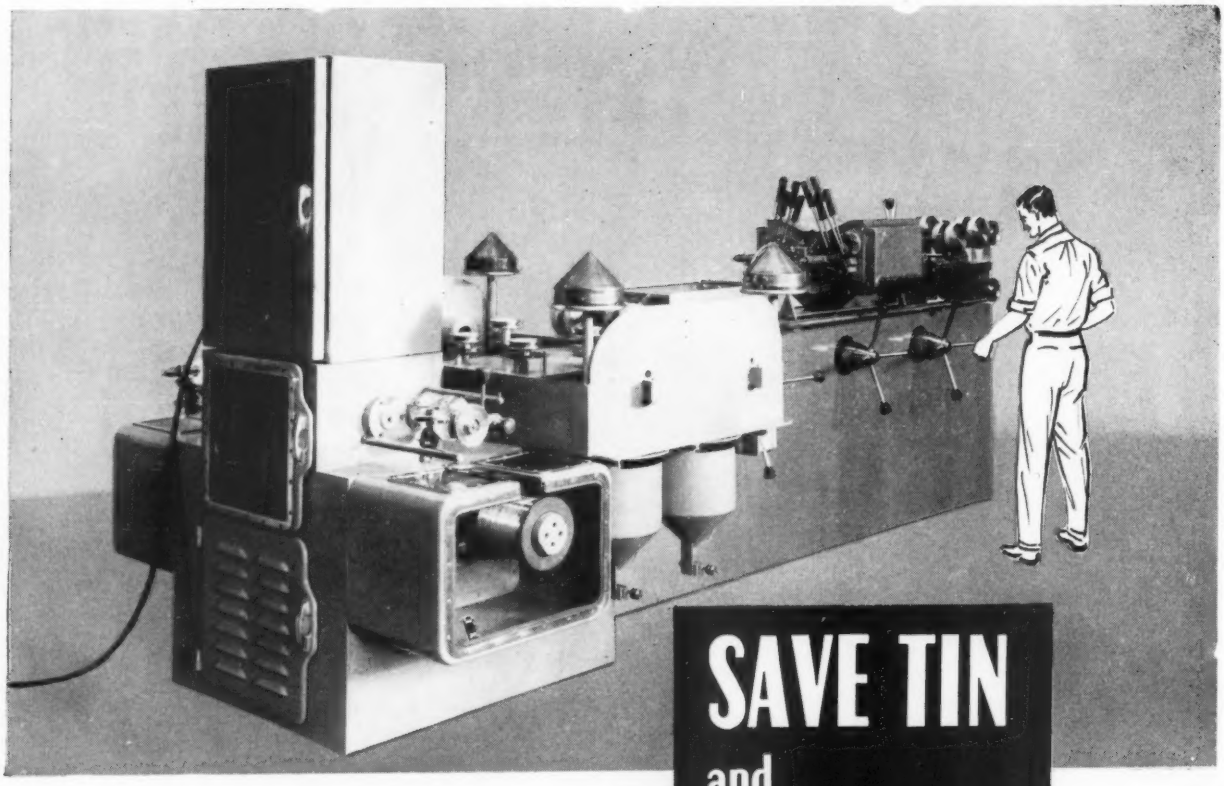

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OUTSTANDING FEATURES :

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DIAMETER OF WIRES : from 24 to 38 B & S
TINNING SPEED : up to 5000 feet per min.
CONSUMPTION OF TIN : Considerably reduced by diamond dies
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FLOOR SPACE required : 600 square feet only

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for stranding insulated wires !

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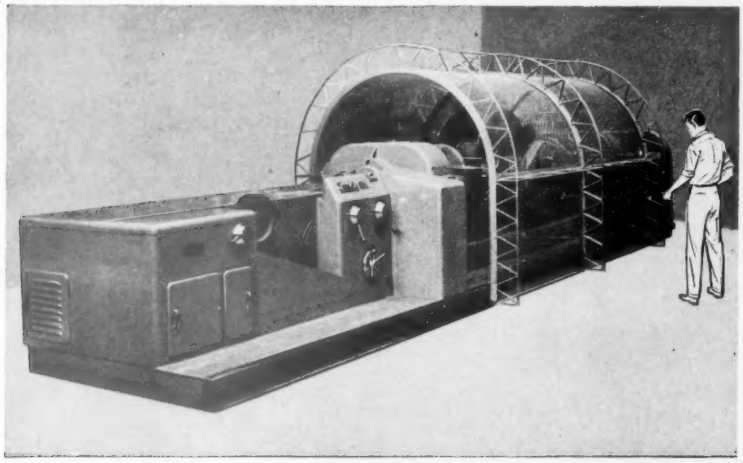

OUTSTANDING FEATURES :

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SYMMETRY STRANDING guaranteed by a spécial device.

Number of conductors up to 4; max. cablediameter: 0,8 inch

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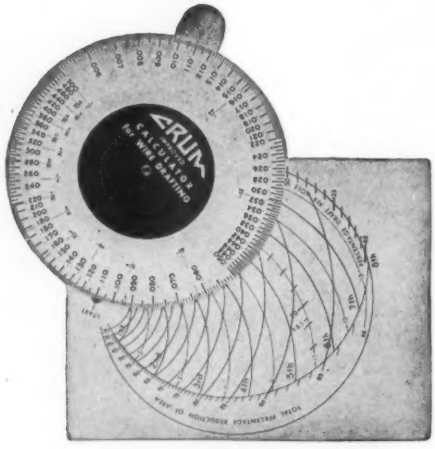
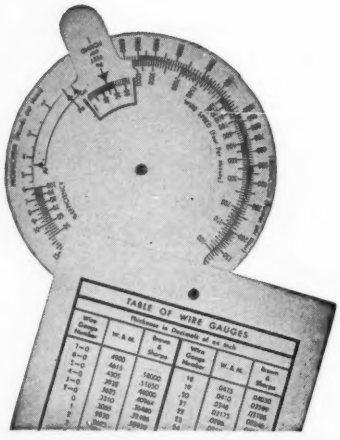
Useful and Accurate!



Front view of Crum Calculator.

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. Provide quicker and more accurate information on die sizes and reduction areas;
2. Calculate wire production rates for various speeds and efficiencies.



Reverse view of Crum Calculator.

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
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- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
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- Still fits your vest pocket.
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- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving —no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

THE PRICE: $5.00 EACH

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A Vaughn consultation on your forthcoming wire production requirements can point the way to profits! Our complete resources are at your disposal—our experience is your assurance of constructive help. *Call us, without obligation of any kind.*

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COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys

With

NOPCO® KLY

a liquid fine wire drawing lubricant

Be sure to try Nopco KLY next time you're drawing fine size steel or fine and intermediate size copper wire. It's *different*—and everything different about it you'll find is a big advantage.

First, this emulsifiable oil mixes quickly and completely with water—hot or cold. This feature alone is enough to make it ace-high with you. But it has other advantages equally important.

Your bath lasts longer. Nopco KLY has a built-in affinity for water. Its lubricants stay *uniformly active* much longer, since the "drag out" of the lubricants from the solution is reduced beyond anything you've ever seen.

Prevents Formation of Insoluble Copper and Lime Soaps—both the copper soaps, which score dies, clog feed lines and screens; and the lime soaps you've been bothered with when drawing lime coated steel wire.

KLY may be used for high carbon, low carbon, limed, galvanized, and liquor finished fine steel wire—also for fine and intermediate copper, bronze, and brass wire. You'll surely want to try this die-saving, cost-saving lubricant soon. Write today for free booklet "Nopco KLY", which gives full instructions, lists percentages of fat in all emulsions.
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YOUR BATH LASTS LONGER

YOU GET UNIFORMLY ACTIVE LUBRICATION

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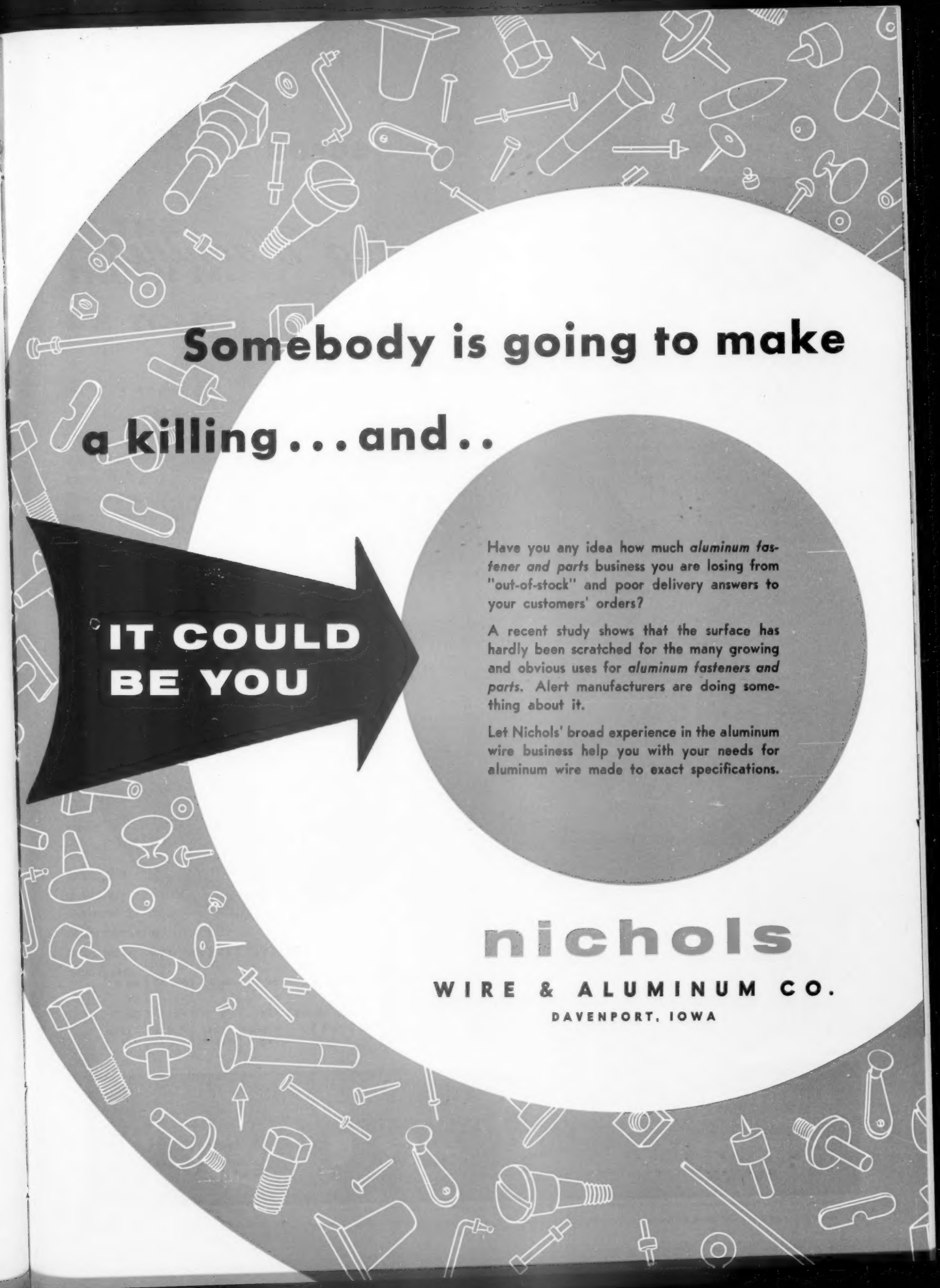
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A recent study shows that the surface has hardly been scratched for the many growing and obvious uses for *aluminum fasteners and parts*. Alert manufacturers are doing something about it.
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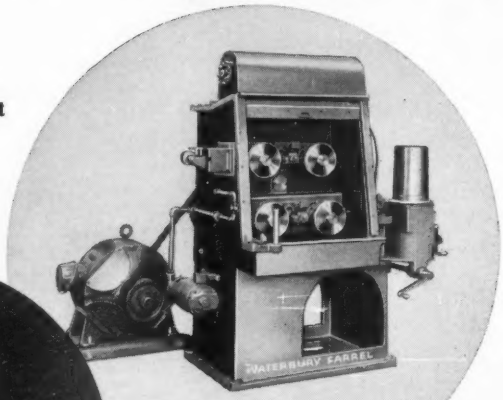
Custom-Engineered Upright Cone *Wire Drawing Machines*

★ **In 4 Sizes**

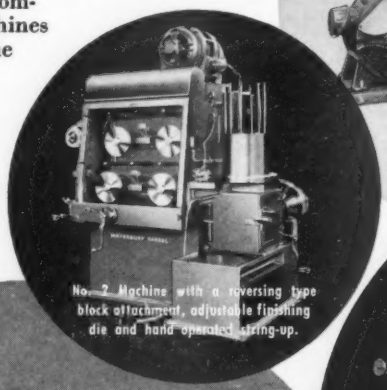
★ **With Drive, String-Up and Packaging Equipment To Fit *Your* Specific Requirements**

★ **And Precision, Quality Construction Throughout**

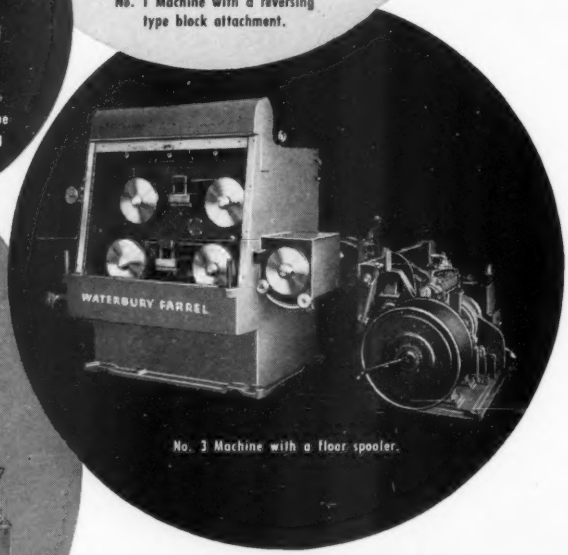
Here are four examples of Waterbury Farrel's long-proven ability to custom-engineer wire drawing machines for specific applications. The machine *you* need may call for another variation in design. For further information on the size and type of upright cone machine fitted to *your* exact requirements, contact Waterbury Farrel, today.



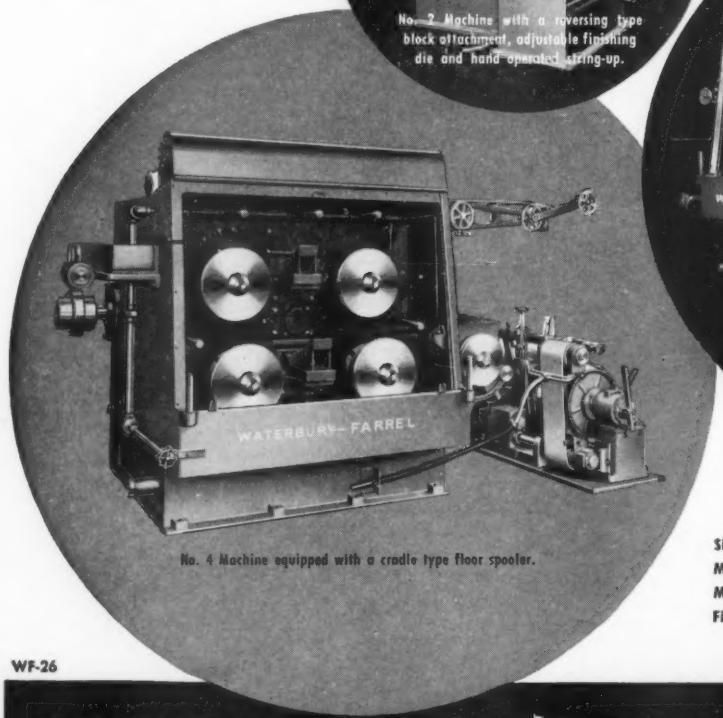
No. 1 Machine with a reversing type block attachment.



No. 2 Machine with a reversing type block attachment, adjustable finishing die and hand operated string-up.



No. 3 Machine with a floor spooler.



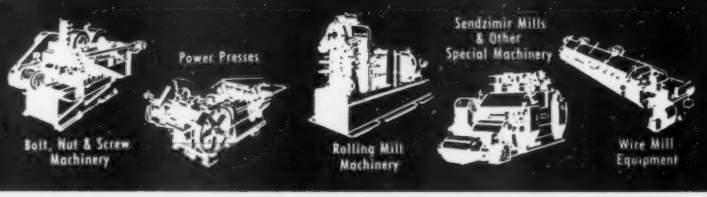
No. 4 Machine equipped with a cradle type floor spooler.

SPECIFICATIONS

	No. 1	No. 2	No. 3	No. 4
Size of Machine				
Max. No. of Dies	16	14	12	13
Max. Starting Size B & S	#14	#8	#4	¼
Finishing Sizes, B & S	#26 to #42	#20 to #34	#14 to #26	#12 to #18

WF-26

WATERBURY FARREL
FOUNDRY & MACHINE CO.
Waterbury, Conn. U.S.A.
Sales Offices: Chicago • Cleveland • Millburn, N. J.



IF THE TRUTH MUST BE TOLD

... *by a spring*

This spring, the dependable heart of a leading make of air pressure gauge, must "tell the truth" years on end. But at first there were tough problems . . . and eventually the manufacturer turned to the Worcester Wire Works Division of National-Standard for a *special spring wire* that would solve them . . .

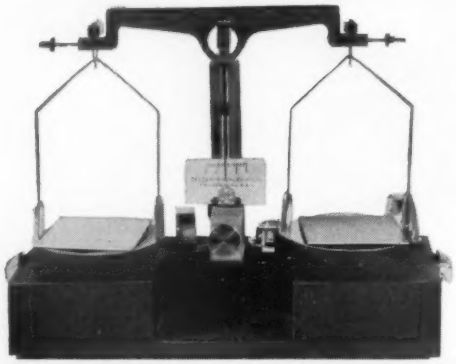
Look how the spring has a double pitch to properly take and indicate a wide range of pressure loads. Obviously, extreme accuracy, exceptional uniformity, and exact behavior are absolute musts. Rejects were running up to 50 per cent!

That is, until Worcester Wire Works studied the requirements, did developmental work, came up with a specially prepared spring wire and so solved the problems!

Like the other National-Standard divisions, Worcester Wire Works features unusual service that helps other manufacturers turn out better products at lower cost. Try us. You'll see.

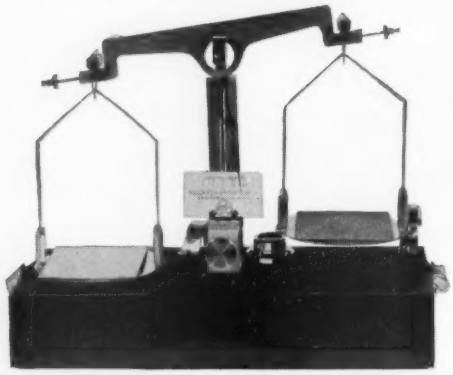
NATIONAL NS NATIONAL-STANDARD Company **STANDARD**

DIVISIONS: NATIONAL-STANDARD, Niles, Mich., *tire wire, stainless, music spring and plated wires* • **WORCESTER WIRE WORKS, Worcester, Mass.;** *music spring, stainless and plated wires, high and low carbon specialties*
WAGNER LITHO MACHINERY, Secaucus, N. J.; *metal decorating equipment* • **ATHENIA STEEL, Clifton, N. J.;** *flat, high carbon spring steels* • **REYNOLDS WIRE, Dixon, Ill.;** *industrial wire cloth*



NO WEIGHT DIFFERENCE. Two identical panels of low-carbon sheet steel were used. They balanced the scale.

RODINE MINIMIZES ACID ATTACK. Each panel was placed in a beaker containing 10% by volume of 66° Bé sulfuric acid at 160°F. The acid in the right-hand beaker was uninhibited. The acid in the left-hand beaker was inhibited with Rodine 82, ¼% by volume of the concentrated acid. There was little or no hydrogen evolution in this beaker . . . Rodine retarded the attack of the acid on the base metal.

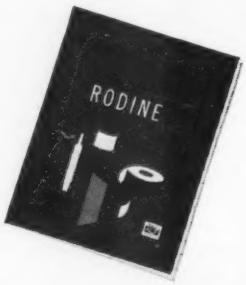


RODINE SAVES METAL. Both panels were removed from the acid pickle solutions after 5 minutes. The one pickled in the uninhibited acid had lost 1.4% of its original weight. The one pickled in the Rodine-inhibited acid had lost only 0.001%. This represents a saving of 26 lb. of steel for each ton pickled; and a simultaneous saving of nearly 50 lb. of 66° Bé sulfuric acid when Rodine is used to inhibit the acid.

ACP Rodine®

SAVES ACID, SAVES METAL— GIVES YOU MORE STEEL TO SELL

With ACP Rodine as the pickling acid inhibitor, you use less acid and have more steel to sell. Up to 50 lb. of acid is saved per ton of steel pickled and up to 26 lb. of steel. Fuming is practically eliminated. Formation of blisters and embrittlement is minimized. Costs of charging and cleaning of pickle baths are reduced—baths can be operated longer, and less acid is required to keep them at desired concentration. There are fewer rejects—steel pickled in acid inhibited with Rodine has uniformly clean, bright surfaces, free of pits, blisters and smut.



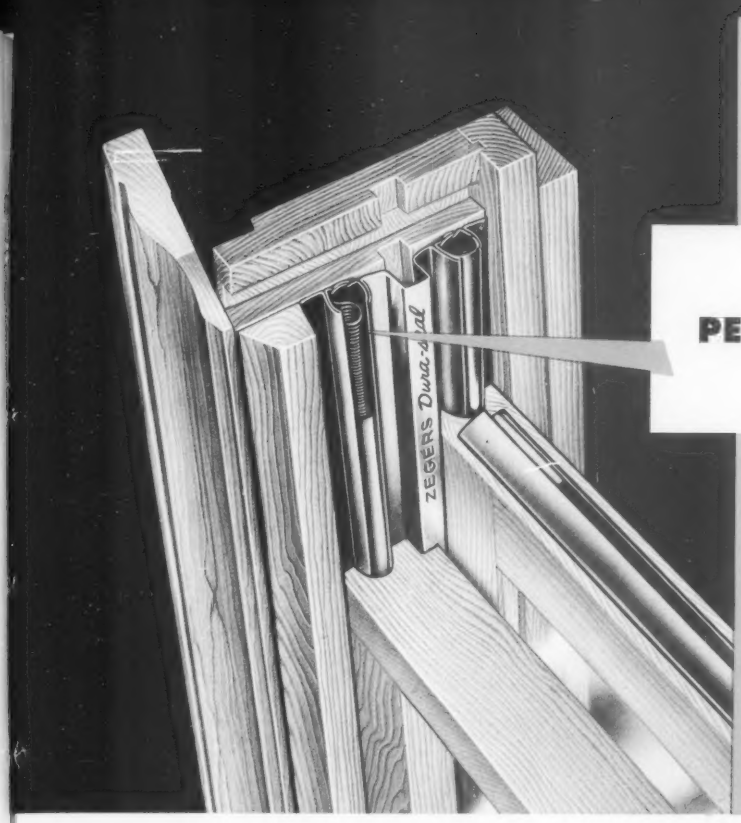
LEARN MORE ABOUT ACP RODINE. Bulletin 1381 tells the complete story. Write for your copy today.

AMERICAN CHEMICAL PAINT COMPANY, Ambler 30, Pa.

DETROIT, MICH. • ST. JOSEPH, MO. • NILES, CALIF. • WINDSOR, ONT.

CHEMICALS ACP PROCESSES

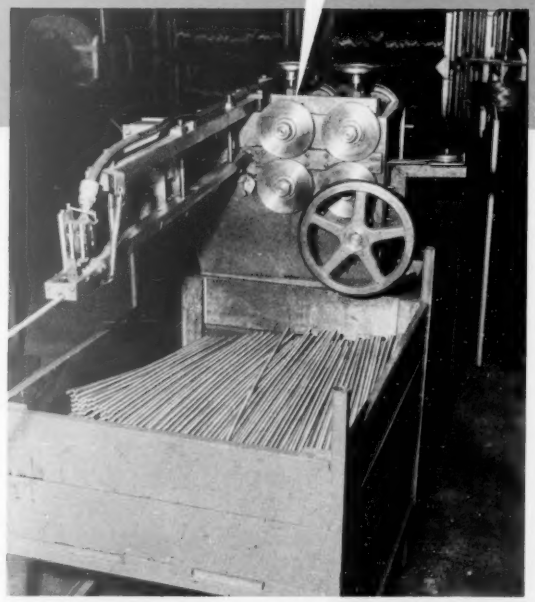
New Chemical Horizons for Industry and Agriculture



GOOD PERFORMANCE HERE

KEYSTONE GALVANIZED MB SPRING WIRE STUDY

BEGINS HERE



Hour after hour, quality springs pop out of this spring machine. The uniformity of Keystone's drawn Galvanized MB Spring Wire assures long, trouble-free runs.

...that's why Zegers, Inc. specify KEYSTONE GALVANIZED SPRING WIRE

The above illustration shows a double hung window equipped with Dura-Seal combination metal weatherstrip and spring sash balance manufactured by Zegers, Inc., Chicago, Ill. Heart of the successful operation of this quality product is its spring balance. Not only must it have exactly the right tension for easy window operation, but must withstand countless flexings over a long period of time. Equally important, it must be easy and economical to produce.

Keystone Galvanized MB Spring Wire is preferred at Zegers for these reasons: Keystone has more consistent uniformity of composition, tensile and diameter—hence less trouble in their spring machines. That's because Keystone's unique method of cold drawing after galvanizing produces a dense, smooth coating free from flaking.

If you use wire to make your products, it will pay you to talk over your needs with your Keystone representative. For more information, send us the coupon below. Tell us how we can serve you.

Keystone Steel & Wire Company, Peoria 7, Illinois

KEYSTONE
WIRE FOR INDUSTRY

Keystone Steel & Wire Company
Peoria 7, Illinois

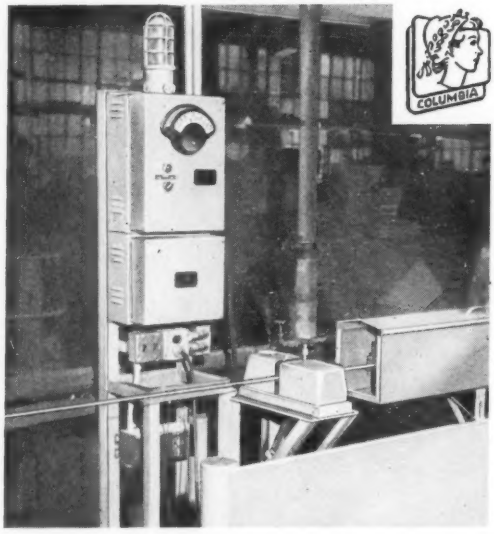
Brand New . . . COLD HEADING FACTS FOLDER . . . send coupon today! New folder discusses uses, applications, methods, technical facts, wire requirements.

Name_____ Title_____

Company_____

Street_____

City_____ State_____

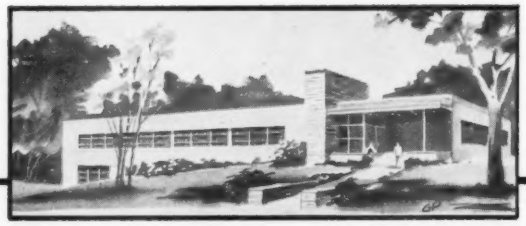


COLUMBIA CABLE AND ELECTRIC CORPORATION manufactures insulated conductors, armored cable, non-metallic sheathed cable and other wire and cable assemblies. They must meet rigid Underwriters' specifications as to minimum and maximum wall thickness of the insulated conductors since these are further processed to constructions which are held to close tolerances.

COLUMBIA CABLE AND ELECTRIC CORPORATION meets these limitations with MICROLIMIT CONTROL. By means of this automatic diameter control equipment, they are able to hold tolerances on their insulated conductors to well within the allowable limits.

YOU TOO can improve the quality of your product with MICROLIMIT CONTROL, whether you produce power cable, communications wire or special purpose extruder-applied materials.

For further information—



INDUSTRIAL GAUGES CORPORATION • WEST ENGLEWOOD, NEW JERSEY

NATIONAL

WIRE

(COLD ROLLED)

in Coils or Straight Lengths

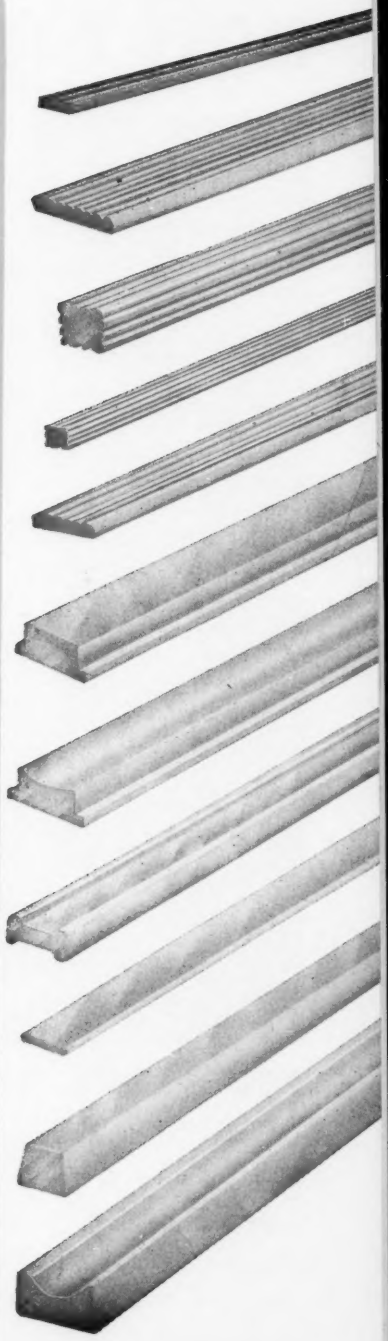
COMPLETE METALLURGICAL SERVICE

Manufacturers of

SPRING WASHERS	RETAINING RINGS
ROUND EDGE FLAT WIRE	KEYSTONE SHAPED WIRE
SQUARE EDGE FLAT WIRE	SPECIAL SHAPED WIRE

Shaped Wire in Coils or Straight Lengths, Ferrous or Non-Ferrous.

LARGE OR SMALL QUANTITIES



Manufactured by

THE NATIONAL LOCK WASHER COMPANY

PRECISION SHAPED WIRE DIVISION

NEWARK 5, N. J. MILWAUKEE 2, WIS. U.S.A.

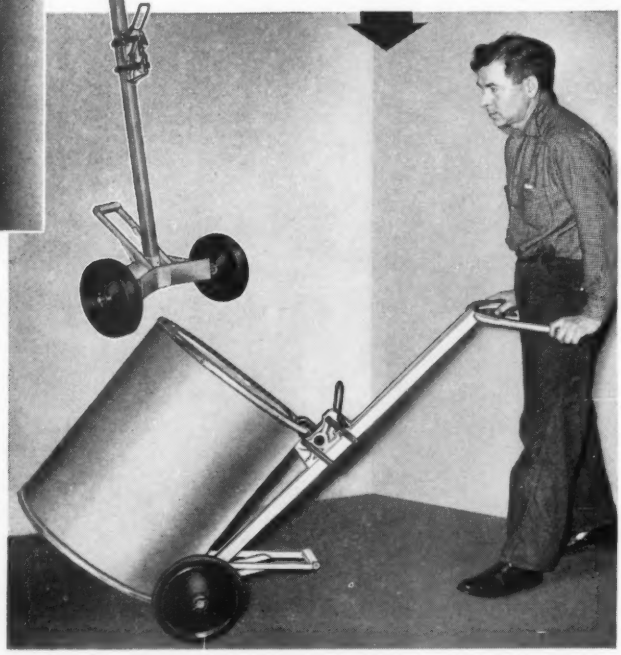
MOVE YOUR Leverpak / Payoffpak } FIBRE DRUMS (OR STEEL)

with MATERIAL HANDLING EQUIPMENT LIFT-O-MATIC

- SAFELY
- AUTOMATICALLY
- EASILY
- ECONOMICALLY

MANUAL DRUM TRUCK

Automatic engagement and release. No prongs or studs to damage drum. Quickly adjustable for drums of any height. Exact placement without any manual handling. Light, (45 lbs.) all-steel welded construction. Steel disc wheels, with full roller bearings, equipped with solid demountable or molded-on rubber tires.



POWER TRUCK ATTACHMENT

One operator can attach or remove in only 2 minutes. Fits any truck, or can be interchangably used on different makes. Engages drum from top only, without damage to bead or rim. Handles all drums, singly or in multiples, regardless of size or kind, open or closed. Automatic, mechanical, maintenance-free operation, without additional operator control. No pallets needed for transporting or tiering.

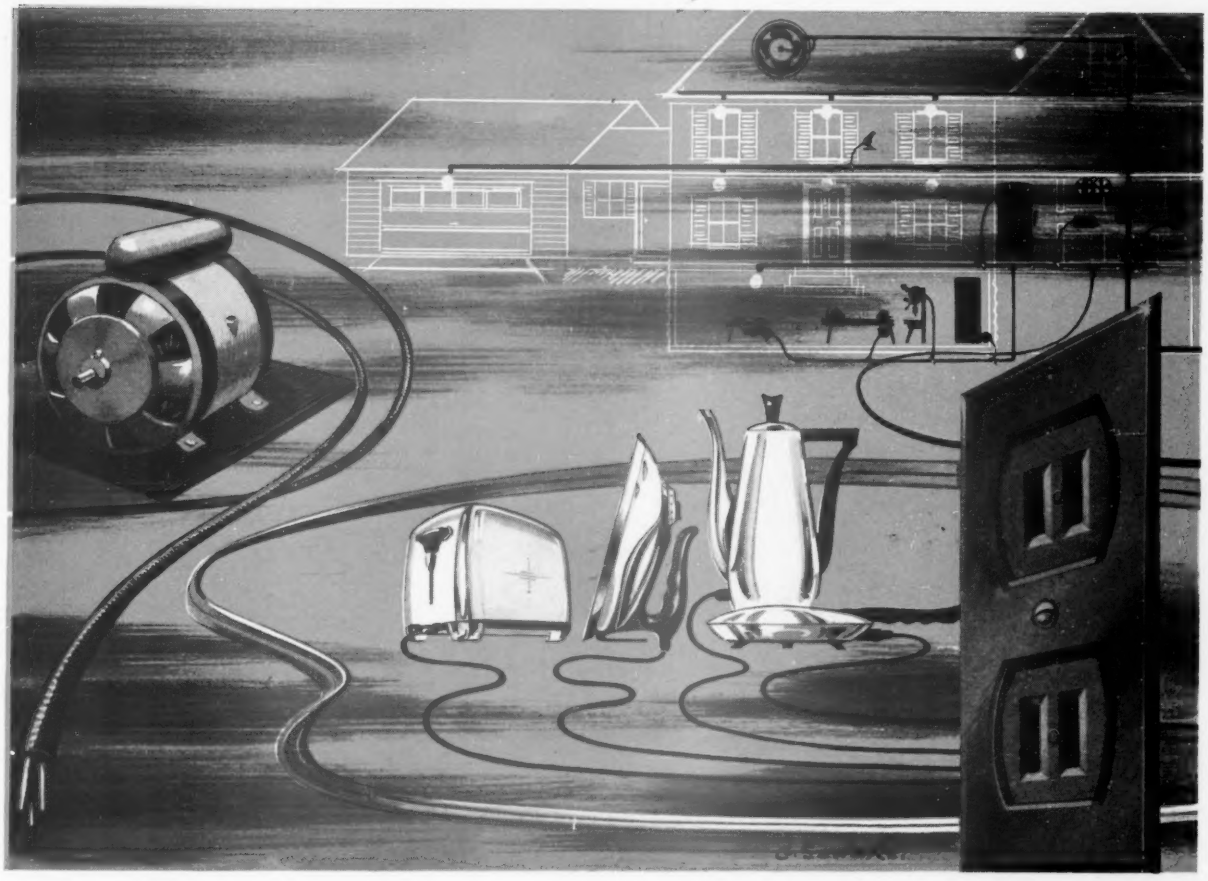
MARVEL INDUSTRIES, INC.

2240 CLEVELAND STREET • EVANSTON, ILLINOIS

FOR FURTHER PARTICULARS CALL DAvis 8-6530
OR WRITE US

Naugatuck MARVINOL

POLYVINYL CHLORIDE RESINS



four resins for electrical application

NAUGATUCK now offers the Wire and Cable Industry *more* PVC resins for insulation extrusion than does any other resin manufacturer.

Two of these Marvinol® resins, VR-22 and VR-23, have already received UL approval. These resins are, respectively, of high and intermediate molecular weight. Both have good dry blending properties.

Marvinol VR-24 and Marvinol MX-2206 are resins of lower molecular weights. They provide high volume resistivity in semi-rigid compounds with little or no plasticizer. Both deserve your careful evaluation for future electrical products.

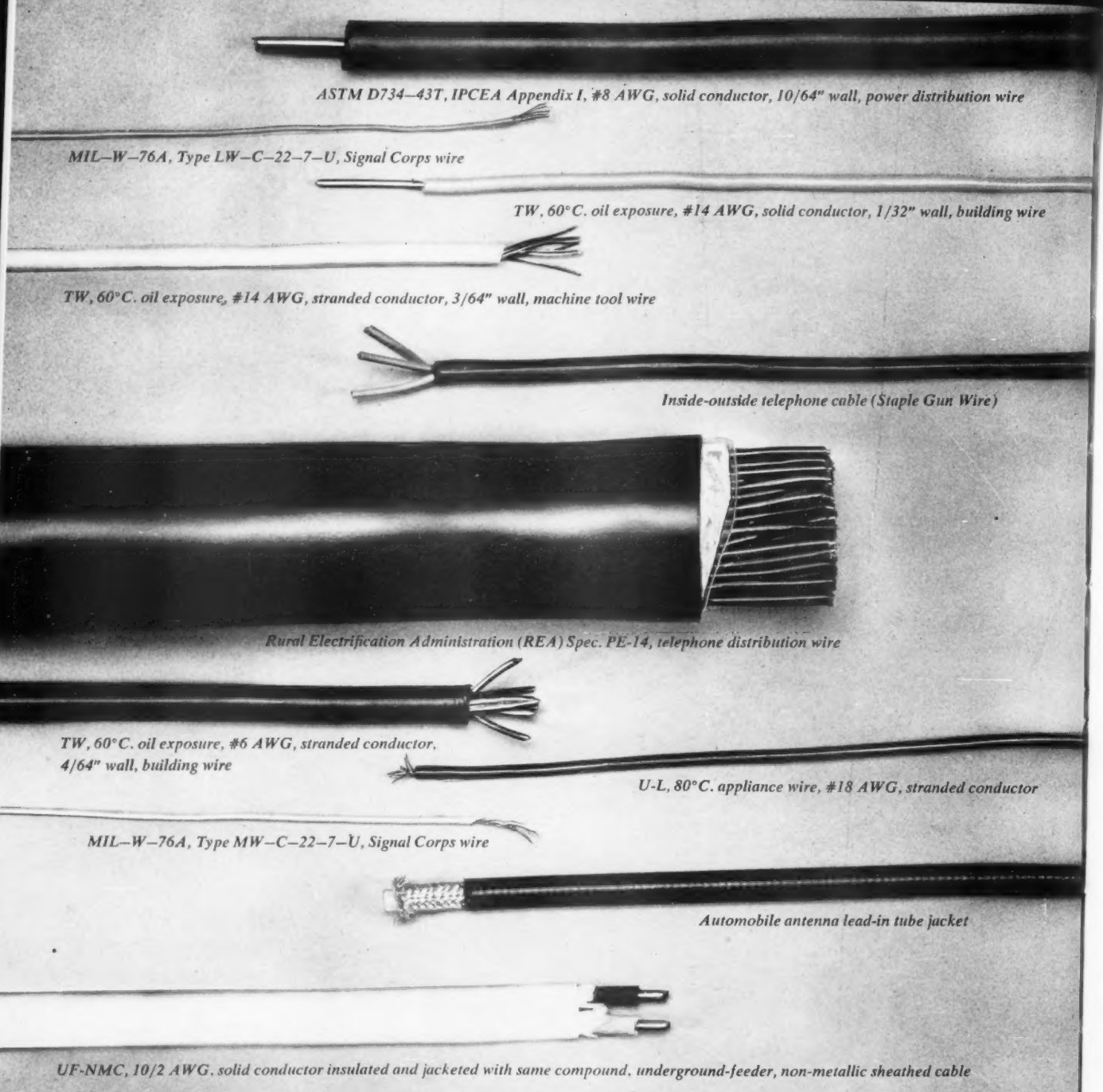
Check with your Marvinol technical representative for complete data and evaluation samples, or write us on your firm's letterhead.

United States Rubber

Naugatuck Chemical Division

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Gastonia, N.C. • Chicago • Los Angeles • Memphis • New York • Phila.
IN CANADA: Naugatuck Chemicals, Elmira, Ontario • Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N. Y.


ASTM D734–43T, IPCEA Appendix I, #8 AWG, solid conductor, 10/64" wall, power distribution wire
MIL–W–76A, Type LW–C–22–7–U, Signal Corps wire
TW, 60°C. oil exposure, #14 AWG, solid conductor, 1/32" wall, building wire
TW, 60°C. oil exposure, #14 AWG, stranded conductor, 3/64" wall, machine tool wire
Inside-outside telephone cable (Staple Gun Wire)
Rural Electrification Administration (REA) Spec. PE-14, telephone distribution wire
TW, 60°C. oil exposure, #6 AWG, stranded conductor, 4/64" wall, building wire
U-L, 80°C. appliance wire, #18 AWG, stranded conductor
MIL–W–76A, Type MW–C–22–7–U, Signal Corps wire
Automobile antenna lead-in tube jacket
UF-NMC, 10/2 AWG, solid conductor insulated and jacketed with same compound, underground-feeder, non-metallic sheathed cable

One vinyl compound for all–versatile OPALON* 1038

Remarkable physical and electrical properties qualify OPALON 1038 for scores of uses

A single insulating and jacketing compound now gives outstanding performance on a wider range of wire and cable applications than has ever been practical before. It is available to you *without* a premium price!

A unique combination of high insulating efficiency, excellent heat resistance and extreme toughness is responsible for the all-purpose versatility of Monsanto Opalon 1038 vinyl compound.

Opalon 1038 is widely used for U-L Type T, TW and exposure to oil at 60° C., as well as for U-L 80° C. appliance wire.

To simplify inventory and stock control, the same compound is recommended for both primary insulation and jacket in UF-NMC, underground feeder and non-metallic sheathed cable. It is especially good for machine tool wiring.

Rugged physical properties, including weather resistance and flame resistance, also qualify Opalon 1038 for insulating large-sized building wire (#6 AWG and over) and for cable jacketing.

All these applications have won appropriate recognitions from U-L, IPCEA, REA and Government agencies. For data sheets and complete information, write Monsanto Chemical Company, Plastics Division, Room 2006, Springfield 2, Mass.

MONSANTO

*OPALON. REG. U. S. PAT. OFF.

"In our business there is no substitute for BRASS"

says HAROLD H. PORTER
of The Star Pin Co., Shelton, Conn.

Mr. Porter explains why Brass is preferred for Common Pins

"Brass is and for a century has been preferred for common pins," states Harold H. Porter, of The Star Pin Co.

Unlike hard-to-plate pins of ordinary steel, brass pins resist corrosion. They are safer to use since they won't stain textiles, garments or papers with rust. From the manufacturer's standpoint, too, brass wire is more desirable to work with than stainless steel.

Good pins can be made only when the wire supplied is of accurate roundness, gauge and temper which is a controlling reason why "Chase" has been a valued supplier of Brass Wire during much of The Star Pin Company's ninety years in business.

Why don't *you* try Chase on your next order for brass wire? A nearby Chase warehouse is ready to serve you!

PIN POINTERS

ORDINARY STEEL	*difficult* to plate; tends to *corrode*
STAINLESS STEEL	*dull* finish; *hard* on tools
CHASE BRASS	*easy* to plate; *easy* to fabricate; *bright* appearance; *resists* corrosion

Chase BRASS & COPPER CO.
WATERBURY 20, CONNECTICUT
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U.S.I.

Vol. II, No. 2

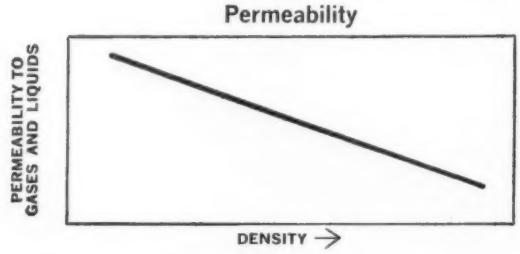
POLYETHYLENE PROCESSING TIPS

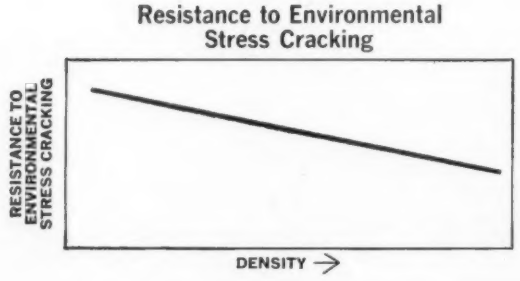
HOW RESIN DENSITY AFFECTS POLYETHYLENE PROPERTIES

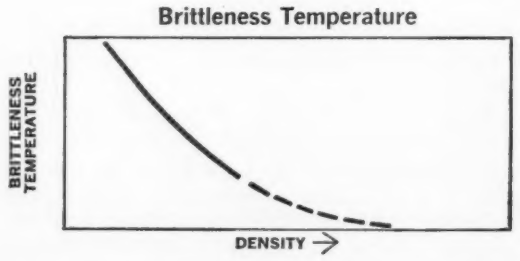
The *density* of a polyethylene is one of three basic characteristics which determine the properties of a processed part. The other two basic characteristics are *molecular weight* and *molecular weight distribution*. Relationships among the three were discussed in Tips, Vol. 2, No. 1 (reprints are available).

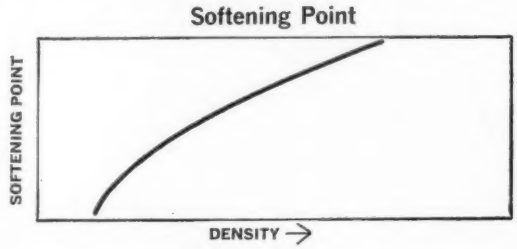
Polyethylene density can range from 0.910 to 0.965. The graphs below indicate what happens to certain properties as density of the resin increases, assuming the other two basic characteristics do not change.

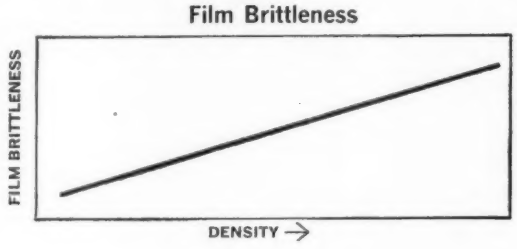
It must be remembered, though, that these graphs do not give the entire story. Molecular weight and molecular weight distribution are often different in resins of different densities, so the effects of all three must be taken into consideration if the end properties are to be predicted. The effects of these other characteristics on end properties will be discussed in future issues of "U.S.I. Polyethylene Processing Tips".

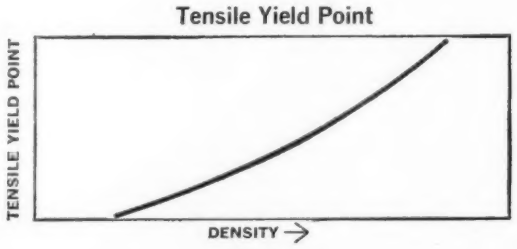


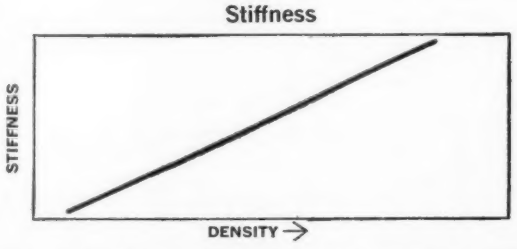












U.S.I. PETROTHENE® Polyethylene resins are now available in densities up to 0.925 and will soon be available over a wider density range. Molecular weight and molecular weight distribution can also be varied at will.

U.S.I. technical service engineers will be glad to work with you to determine what resin characteristics can give you the properties most suitable for the polyethylene product that you are making – or plan to make.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corporation
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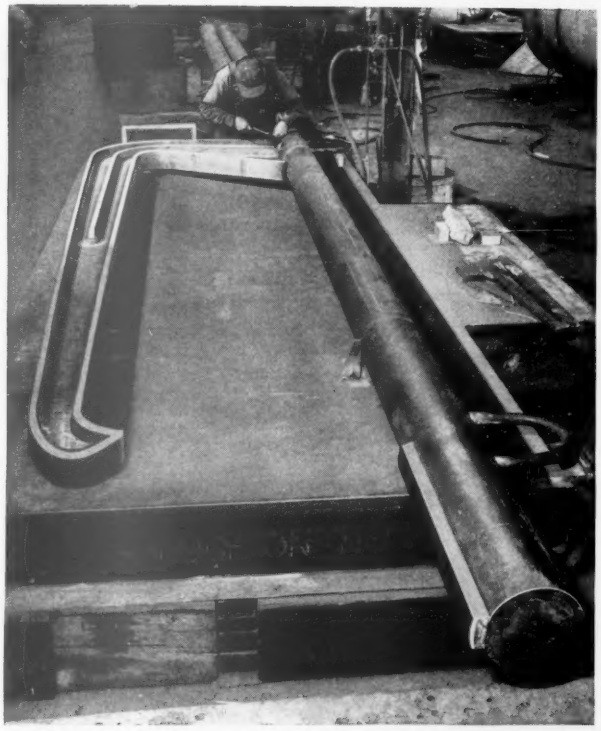
Branches in principal cities

Giant WELDCO HAIRPINS HANDLE 3 tow LOADS

At DONORA, PA.
WIRE AND ROD MILL



Youngstown Welding builds high capacity hooks . . . . . for extra years of pickling

WELDCO Hooks—like the one shown above—are especially built for long, heavy-duty service. These sturdy hooks are light-weight but tough . . . handle payloads up to 6,000 pounds, are exceptionally corro-sion-resistant, and outlast heavy cast hooks 2 to 3 times.

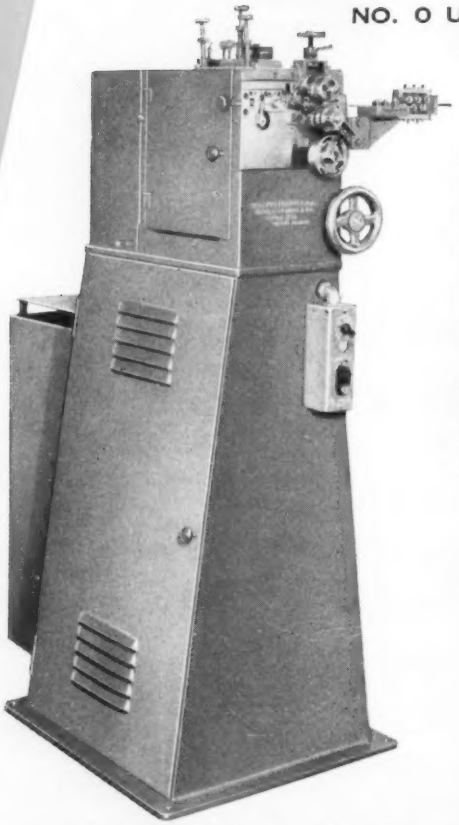
WELDCO hairpin hooks are used in many steel plants, because their superior design makes them readily adaptable to all types of handling equipment. Let us show you how to cut pickling costs and im-prove your production methods. Your phone call or letter will bring complete in-formation on WELDCO hooks . . . the hooks made for long, economical, heavy-duty service!

WELDCO

THE YOUNGSTOWN WELDING & ENGINEERING COMPANY
3700 OAKWOOD AVE. · YOUNGSTOWN 9, OHIO

NEW

NO. 0 UNIVERSAL SPRING COILER
ESCAPEMENT TYPE



Wire Range .008″ to .031″.

Wire Feed Range 0 to 73″.

AC-DC Drive with rectifier control and P. B. Station.

29 to 290 ft. per minute feed range.

No disconnecting drive clutch.

Automatic cycling attachment gives up to 513″ of wire feed.

Manual cutter control allows continuous coiling and cutting at will of operator.

SERIES 720
73″ MODEL

Torsion tooling attachment for producing torsion type springs — available at extra cost.

Write for latest information.....

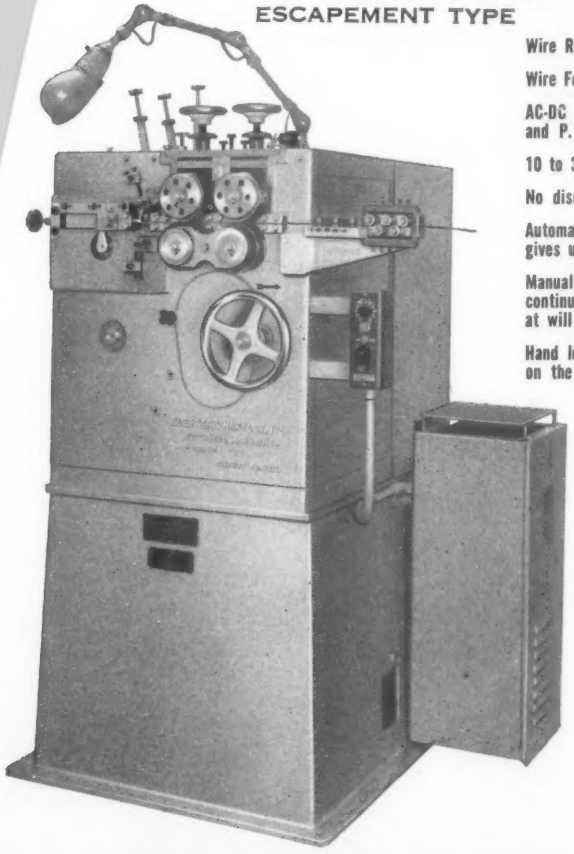
SLEEPER & HARTLEY

Universal Escapement Coilers

Here are the first high production coilers designed for the spring maker. NOW you can get as much as 50% or more spring production. Outstanding features on these S & H machines are the wire feed accuracy and the design engineering that allow you to increase the feed range without any decrease in capacity.

Nothing stops and starts but the wire itself. The continuous rotation feature means fewer parts to give you trouble-free operation and less down-time for maintenance and repairs. Remember S & H machines are the product of years of intensive research and engineering. They are the most advanced coilers you can get for high speed production.

NO. 1 UNIVERSAL SPRING COILER
ESCAPEMENT TYPE



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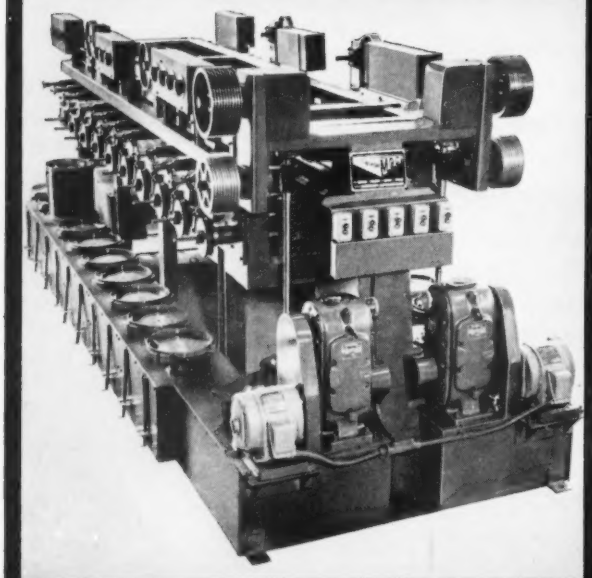

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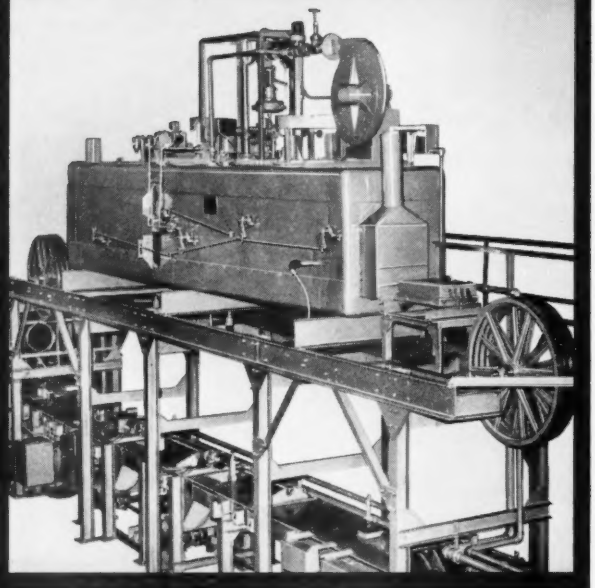

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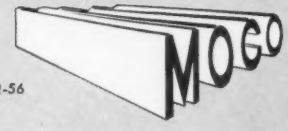
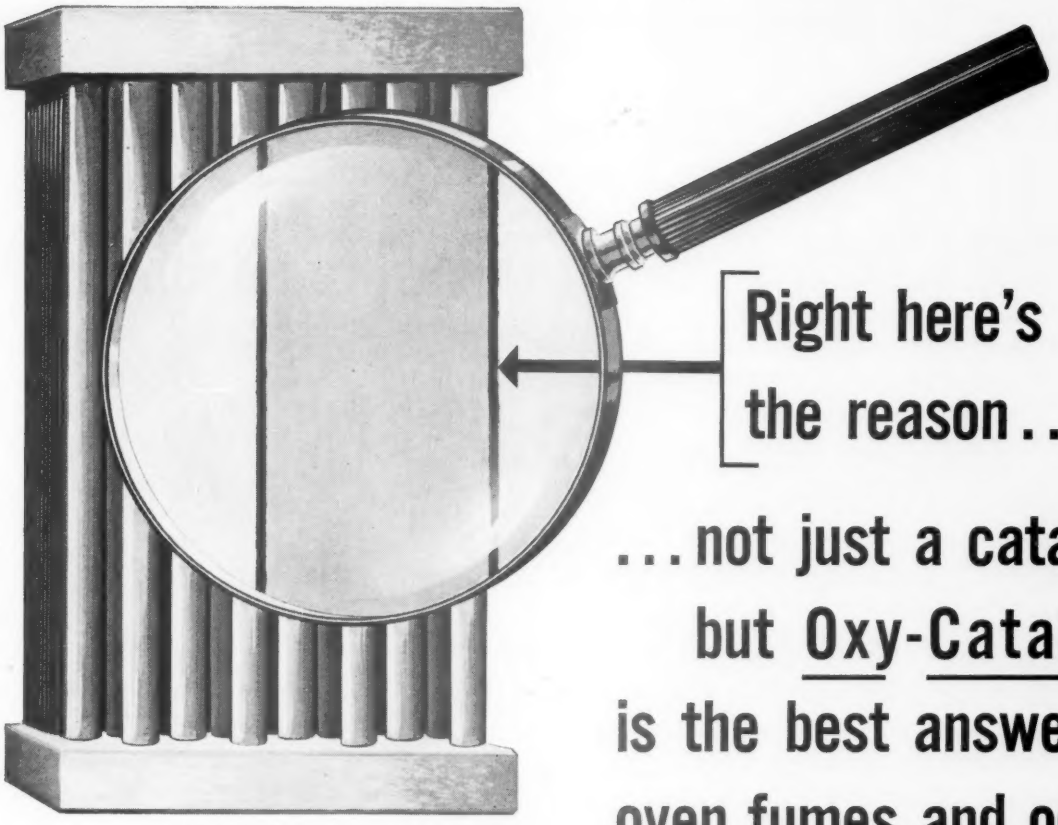


W2-56



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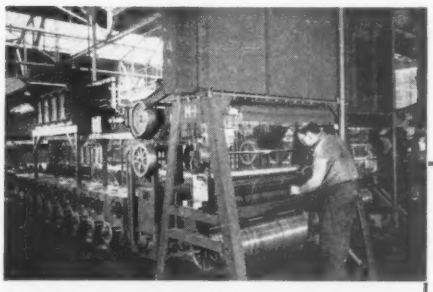

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THE TIME: October 14th through the 17th, 1957
THE PLACE: LaSalle Hotel, Chicago, Illinois

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All persons active in the wire industry are cordially invited to attend the Convention.

We hope you will make your arrangements at this time to be present at this meeting.

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RICHARD E. BROWN, Executive Secretary

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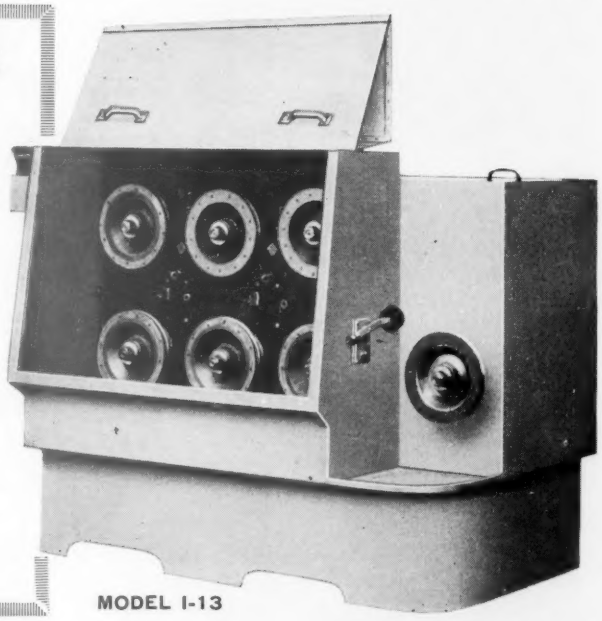

MODEL I-13

The COOK Heavy Duty Rod Breakdown Machine, Model D-13

specifications:

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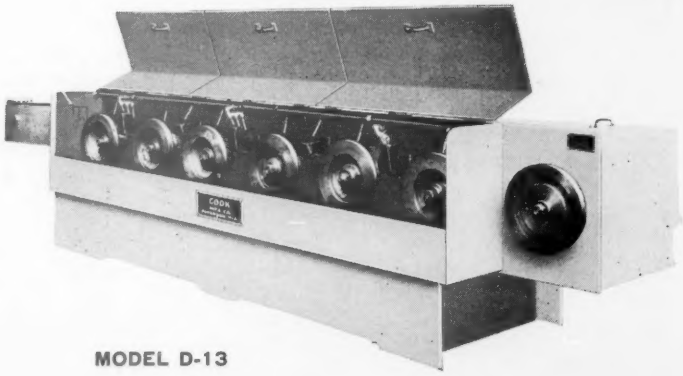
Finished Wire Size	#8 to 16 B&S Gauge
Maximum Operating Speed	5,000 ft./minute
Maximum Number of Dies	13
Number of Drawing Blocks	6
Maximum Size of Die Case	1½" dia. x 1" thick
Spool Capacity	1,000 lbs.
Spool Traverse	11"
Spool Diameter	30"
Motor Size (maximum)	200 HP



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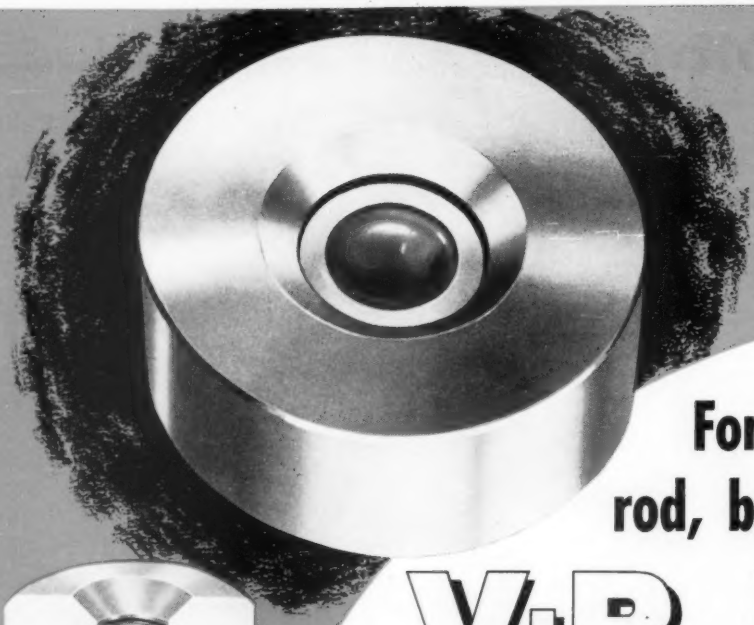

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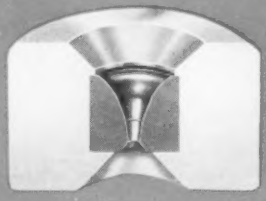

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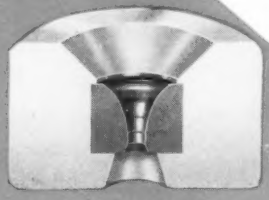
.015 to .200



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The Wire Outlook

Steel production has continued to decline and is now well under 90%. The low point reported was the Cincinnati area, where ingot production was down to nearly 69%. High spot in the country is the Far West, which is operating at better than 105% of rated capacity. The heart of the steel industry, Pittsburgh, had dropped only to 94% at this writing.

The pick-up that was hoped for in the spring months failed to materialize. Auto sales are not now expected to top 1956, home building is considerably off and factory shipments dipped slightly at the end of the first quarter. The principal gain has been in contract awards for heavy construction—utility expansion, public works and the like. These are up over 11%. Industrial plant, office building and store construction has risen over 2½%.

However, we are entering the traditionally slow summer months and too much cannot be expected until fall. This is not to imply that business is bad. Taken as a whole, it is good. Individual incomes are increasing, employment is near peak levels and retail sales are going well.

Inventories have been rising steadily, probably as a hedge against higher prices. Total inventories at the end of the first quarter amounted to 52.2 billion dollars, some 4.8 billions higher than a year ago. Stocks are in heavier relation to sales than last year. Installment credit has risen 40 millions, but is way under the corresponding 1956 increase of 197 millions. March installment credits totalled 3.3 billions, with repayments amounting to 3.2 billions.

Congressmen have been amazed at the flood of mail insisting on economy in government spending and a reduction in the public debt. Tax cuts have been widely demanded. Any budget cuts made, in spite of the clamor and the Washington talk, are going to be minor and insufficient to make possible any tax or debt reductions. Why? Because each legislator wants economy to be effected in some other than in his own bailiwick. The result is that the cost of living will keep inching up, spurred by Washington extravagance. It is expected to be 2.7% higher than in 1956 and has risen in 19 out of the last 23 years. To give a picture of what budget paring would do, a cut of 3 billion dollars would only allow a reduction of about $100 to each individual income taxpayer.

The brass mills are emerging from the doldrums and are reporting a spurt in orders. Copper is in good supply. The importance of a healthy automotive industry to the copper product manufacturers may be gathered from a recent statement to the effect that an average of 45 pounds of copper go into each car made. Six million cars thus would require 270,000,000 pounds of copper—for radiators, gaskets, oil tubing, wiring harnesses, starters and generators. Nearly half of it would be for conductor wires.

Road building and construction is keeping manufacturers of wire for that purpose busy. Volume is rising. Manufacturers' wire sales are making slow, but steady upward progress. Merchant wire product sales are sluggish and not up to expectations. Upholstery wire is spotty. Heading and spring wire orders have shown a modest improvement.

While things could be better, they are not too bad. A recent Dun and Bradstreet survey among some 1,500 executives indicated that over 5 times as many look for an increase in the third quarter over last year's sales. It also showed that a majority did not anticipate any price increases this year, the remaining stating 10 to 1 that their prices would be up.

Research projects are on the increase. While such work is primarily for new products, there is also constant pressure for more efficient production methods. Such efforts constantly spark progress.

Edmund Duval Sickels
EDITOR

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(No. 6 of a series)

PRODUCT	SHIPPING INFORMATION	USES
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PXP Special Compound	Steel Drums 400# Net	Outstanding drawing results mixed at 1 to 5 concentration for ferrous tubing. Low cost.
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Vol. 32 JUNE, 1957 No. 6

Effect of Prior Anneal Temperature on 18/8 Wires

by Samuel Storchheim
President and Technical Director
Metals Research & Development Incorporated
Exeter, Pennsylvania

Over the past two years the author has treated of various phases of the heat treating and cold working of stainless steel wire. In this article he covered another problem for the benefit of our readers.

It is relatively well known that nonmagnetic austenitic stainless steel of the 302 type can be made permanently ferromagnetic by cold deformation. The process involved is the transformation of the paramagnetic austenitic into ferro magnetic martensite. The greater the deformation, normally, the greater the conversion of the one phase into the other. With this greater conversion are associated increasingly greater changes in the magnetic, electrical, mechanical and chemical properties of the alloy being deformed.

★ ★ ★

The converse of the above is that heating the deformed alloy causes the martensite to revert to austenite, again causing the properties of the alloy to change. By progressively increasing the heat treating temperature, more and more of the martensite is transformed to austenite until a temperature is reached whereby martensite no longer exists.

★ ★ ★

The changes of the properties obtained by cold working and subsequent heat-treating of an 18/8 alloy can and are also affected by the alloy's chemical composition. What occurs is that certain elements promote the austenite to martensite transformation while others suppress it. These elements aiding the transformation include: niobium, silicon, molybdenum and chromium. Those retarding the conversion include: carbon, nickel and manganese.

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The effects of cold work, heat-treatment and some data concerning the influence of chemical analysis on the magnetic properties of 18/8 stainless steel wire have been previously presented. (1,2) This article is concerned with the effect prior anneal temperature has upon the magnetic properties of wire subsequently cold drawn. The magnetic parameters measured and presented in this article are the remanence Br and coersive force, Hc. These values were obtained by projecting the magnetic hysteresis loops of the wires being tested upon the screen of a cathode ray oscilloscope. This oscilloscope was part of a specially designed hysteresis loop tester (3) capable of testing wires of a maximum of 1/8" diam.

★ ★ ★

The minimum length of wire required was 3" and normally six strands of 0.004" diam. wire were tested simultaneously. The six strands were from a sample representing one set of reaction conditions; i.e., the strands were from the same sample. The reason several strands of wire were required was that the remanence readings could be made with greater precision. Because more strands were used, the total amount of wire under test allowed for more lines of flux to be available; i.e., the length of the hysteresis loop produced was greater and therefore the remanence could be more readily measured. Coersive force depended upon the applied magnetizing field. Thus, it remained constant regardless of how many strands of wire were used once it had been established at its maximum value. Remance values were determined to within ± 5

pct accuracy while coersive force evaluations were within ± 2.5 pct.

Prior Anneal Temperature Affect

Normally, wire was annealed at 2150°F in a dissociated ammonia atmosphere. Following this, it was then cold drawn through a series of progressively smaller diamond dies at a speed of 250 feet per min. in a commercial wire drawing machine. The drawing procedure was continued for several minutes in order to insure a uniformity in the rate of reduction. When this time had elapsed the wire drawing unit was stopped quickly. The wire remaining between each set of dies was removed, labeled and then tested. What was done to deviate from this schedule was to vary the anneal temperature and observe the subsequent effect cold deformation had upon the magnetic properties of the alloy. In addition, wires of various chemical analyses were tested in order to see what effect analysis had. Table I shows the analyses of the alloys used, while tables II, III, IV and V contain the magnetic data obtained for wires annealed at various temperatures and cold deformed increasing percentages. Fig 1 is a plot of the remanence values obtained vs. the percent cold deformation for three different prior anneal temperatures. It is seen that all the three curves are similar and show a parabolic increase in remanence with increasing percent of reduction of area. In addition, the three curves are displaced from each other, i.e., with increasing prior anneal temperature, the very rapid rate of martensite appearance is delayed. Thus, the wire annealed at 1600°F has its rapid rise inflation point at about 43% reduction of area; the wire annealed at 1700°F close to 47% reduction and the wire annealed at 2150°F at approximately 58%. For the same reduction of area the remanence values of the curves for the 1600 and 1700°F anneals are greater than for the 2150°F anneal temperature curve.

★ ★ ★

Fig. 2 is a plot of the coersive force values measured as a function of percent reduction of area for the same wires discussed in

TABLE I

CHEMICAL ANALYSES BY PERCENT

No.	Ni	CR	Mn	Si	C	Mo	Fe
1	8.30	18.64	0.55	0.54	0.15	.20	bal.
2	8.75	18.08	0.54	0.38	0.08	.10	"
3	9.41	18.39	0.91	0.59	0.08	not found	"
4	0.01	18.62	0.89	0.42	0.10	---	"
5	9.11	18.77	0.56	0.55	0.065	.34	"

TABLE II

EFFECT OF VARYING DEGREES OF REDUCTION OBTAINED BY COLD WIRE DRAWING ON THE COERSIVE FORCE AND REMANENCE ON 18/8 STAINLESS STEEL ANALYSIS.
No. 1 ANNEALED AT 2150°F

% Red.	HC oersted	BR gauss
0	---	---
14	400	20
26	400	100
38	280	210
49	210	510
59	200	1650
68	170	3280
71	140	3750
75	160	3920
79	120	5360
82	120	5480
85	100	6100
86	100	6390
87	85	6950
90	90	7450

TABLE III

EFFECT OF VARYING DEGREES OF REDUCTION OBTAINED BY COLD WIRE DRAWING ON THE COERSIVE FORCE AND REMANENCE ON 18/8 STAINLESS STEEL ANALYSIS NO. 2.

	Annealed at 1600°F		Annealed at 1700°F	
% Red.	HC	BR	HC	BR
0	non-magnetic		non-magnetic	
20	slightly magnetic		240	100
30	210	930	240	720
40	200	1300	200	1300
50	160	3360	150	2100
55	150	4000	130	3700
65	110	6400	110	6000
70	95	7250	80	7500

Fig. 1. The trend in all three cases is for curvilinearly decreasing coersive force with increasing per-

TABLE IV

EFFECT OF VARYING DEGREES OF REDUCTION OBTAINED BY COLD WIRE DRAWING ON THE COERSIVE FORCE AND REMANENCE ON 18/8 STAINLESS STEEL, ANALYSIS NO. 3.

	Annealed at 1400°F		Annealed at 1900°F	
% Red.	HC	BR	HC	BR
0	non-magnetic		non-magnetic	
15	250	100	non-magnetic	
40	380	1000	360	170
60	310	3000	310	640
70	250	4930	260	1260

TABLE V

EFFECT OF PRIOR ANNEAL TEMPERATURES ON THE REMANENCE AND COERSIVE FORCE OF WIRE SUBSEQUENTLY COLD DRAWN 65%

Anneal Temp. °F	HC	BR
1400	100	7400
1600	65	6000
1800	120	5000

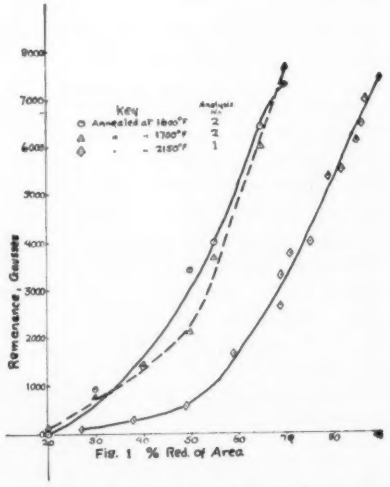

Fig. 1 % Red. of Area

cent of reduction of area. The curves representing the 1600 and 1700°F prior anneal temperature are not displaced sufficiently to be of appreciable consequence; however, the curve for the wire annealed at 2150°F is considerably displaced from the other two. For the same percent reduction of area, its coersive force is greater.

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Fig. 3 is a plot for each sample of wire reacted of its coersive force

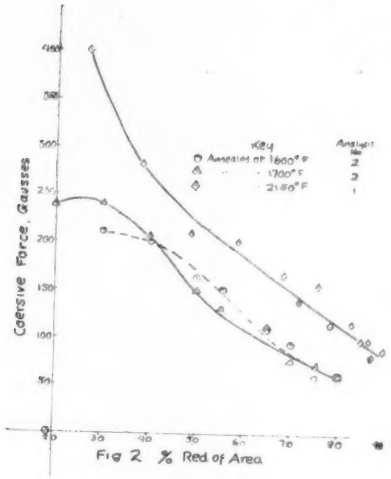

Fig 2

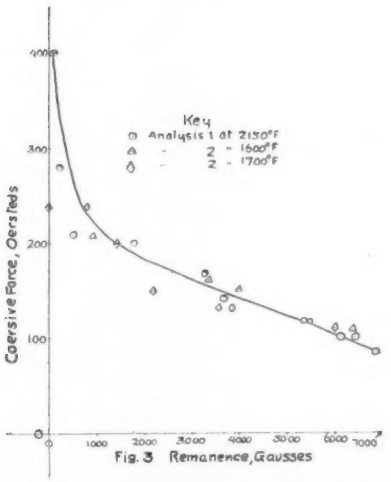

Fig. 3

vs. the remanence for the three sets of wire discussed above. The average curve thru all the points shows an initial very sharp decrease in coersive force as the remanence increases. This is followed by a gradual coersive force decrease as the remanence rises. It is interesting to note that for the chemical analyses of the wires involved, the fundamental relationship between remanence and coersive force is about the same regardless of the temperature of prior anneal and the percentage of cold reduction chosen. That is, any point plot of coersive force and remanence for a particular wire of these analyses irrespective of from which set of reaction conditions they are chosen, falls close to the relationship established in Fig. 3.

★ ★ ★

Thus it has been learned that:

a. Remanence rises with increasing percentage of cold deformation, the rise being inhibited by higher prior anneal temperature.

b. Coersive force decreases with increasing percentages of cold deformation, the decrease being inhibited by higher prior anneal temperature.

c. Regardless of prior anneal temperature and percentage cold reduction, the relationship between remanence and coersive force, for the two analyses of wire studied, remains the same.

★ ★ ★

In order to broaden the investigation more fully, it was decided to repeat the experiments previously conducted; however this time another analysis of 18/8 was used, see analysis 3. In addition, the annealing temperatures used were somewhat different than those of the previous experiments, namely 1400°F and 1900°F. Fig. 4 is a plot of remanence versus the percentage reduction of area for wires annealed at the two indicated temperatures. Observe that in this case, as in the case for the previous alloys studied, see Fig. 1, increasing percentages of cold reduction caused the remanence to increase for both specimens annealed at different temperatures. As in Fig. 1, the curves plotted are displaced from each other showing again the marked effect that anneal temperature has upon the magnetic properties of cold-worked wires. In this case, the wire annealed at 1900°F exhibited a remanence of only about 150 gausses after it had been reduced 40% in area. In comparison, the wire annealed at 1400°F showed a substantial remanence at 40% reduction, approximately 1000 gausses. The inflection in the curve for the wire annealed at 1900°F was approximately at 63% reduction of area, while the inflection point for the wire annealed at 1400°F was at about 57% reduction of area.

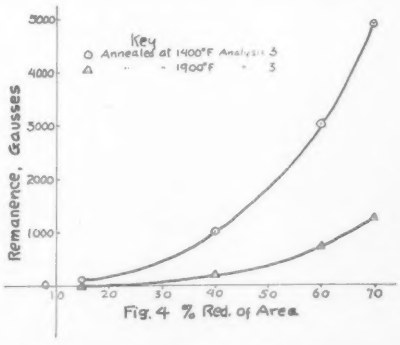

Fig. 4

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Figure 5 represents a plot, for these same wires, of coersive force vs. percent reduction of area. In this case, the two curves are quite similar, both showing a coersive force decline as reduction of area is increased. This is the same trend as was found for the wires of the other analyses, see Fig. 2. However, the displacement of the curves in Fig. 5 is not as clearcut as was in Fig. 2.

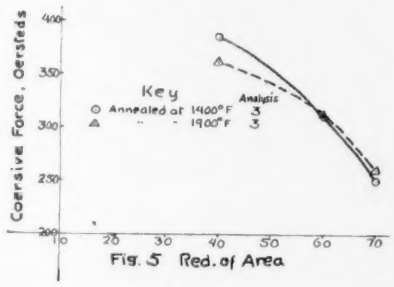

Fig. 5

The effect of prior anneal temperature is again observed in Fig. 6. Here are plotted vs. anneal temperature the remanence values of wires of the same analysis cold worked 65%. Again the decrease in remanence with increasing prior anneal temperature is clearly observed. Thus, from all of the above data, it may be seen that the prior annealing temperatures which decide the prior grain size, had a considerable effect upon the final magnetic properties of the wire. There is a noticeable decline in remanence with an apparent increase in coersive force with increasing anneal temperature. This indicates that the finer the austenitic grain size, the less is the cold work necessary to produce the same remanence and coersive force values.

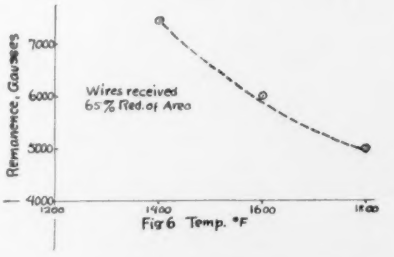

Fig 6

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This can be expressed somewhat

(*Please turn to page* 710)

The Extrusion of "Teflon" 6 Tetrafluoroethylene Resin for Wire Insulation

by

D. N. De Young and G. R. Snelling

Polychemicals Department

E. I. Du Pont De Nemours & Company, Inc.

Wilmington, Delaware

This paper was presented at the Fifth Annual Wire and Cable Symposium of the Signal Corps Engineering Laboratories in Asbury Park, N. J., on December 6, 1956.

The importance of "Teflon"* tetrafluoroethylene resin as a wire insulating material is due to its unique electrical and physical properties. These properties are discussed in a paper by Doban, Sperati and Sandt (1) and summarized in Table I.

TABLE I

ELECTRICAL AND PHYSICAL PROPERTIES OF "TEFLON"

Property	ASTM Method	Average Value
Continuous Service Temperature		up to 500°F
Dielectric Constant, 23° C (73° F), 60 to 10^9 cps	D150-54T	2.00 - 2.05
Dielectric Strength (short time 0.010")	D149-44	2000 - 3000 volts/mil
(short time 0.080")	D149-44	600 volts/mil
Surface arc resistance	D495-48T	>700 (does not track)
Volume Resistivity, 23°C (73°F), 100% R.H.	D257-52T	$>10^{15}$ ohm-cm
Surface Resistivity, 23°C (73°F), 100% R.H.	D257-52T	3.6 x 10^6 meg ohms
Power Factor, 60 to 10^8 cps	D150-54T	<0.0003
Moisture Absorption	D570-42	<0.01%
Flammability	D635-44	nonflammable
Chemical-resistance		inert to almost all known solvents (1)
Weather Resistance		Excellent (2)
Colorability		Unlimited
Tensile Strength, 23°C (73°F)	D638-52T	1,500 - 3,000 lb/sq. in.
Elongation, 23°C (73°F)	D638-52T	100 - 200%

(1) "Teflon" attacked only by alkali metals under certain conditions. Halogens and certain halogenated chemicals and solvents at high temperature and pressures may also affect "Teflon."

(2) No detectable change after 10 years of outdoor exposure in Florida.

"Teflon" is used principally for wire insulations which require its excellent electrical properties at high and low service temperatures as discussed by Ely (2) and Ondrejcin (3). Typical end use examples are electronic hook-up wire, aircraft power wire, wire for corrosive areas, coaxial cables, and wire for small electric motors.

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There are six processes used in insulating wire with "Teflon". Each of these processes was developed for a specific type of "Teflon" and/or a general application of the insulation as governed by the wall thickness of the jacket. Table II shows the field of use for each of these processes.

TABLE II

WIRE AND CABLE INSULATED WITH "TEFLON"

Method of Processing	Form of "Teflon" Used	Insulation Thickness, mils
Dip Coating	Enamel, made from aqueous dispersion (1)	0.5-1 mil per dip
Extrusion (compounded)	"Teflon" 6 extrusion powder	8 to 50
Calendering	"Teflon" molding powder	15 to 100
Ram or Screw Extrusion	"Teflon" molding powder	40 to 500
Tape Wrapping	Tape made from extrusion powder, molding powder, cast film, or a coated glass fabric	1 and up
Melt Extrusion	"Teflon" 100X	4 and up

(1) "Teflon" enamels are supplied by the Fabrics and Finishes Department of the du Pont Company.

Of these processes calendering and melt extrusion are still in a development stage. Calendering is being studied in an effort to improve on the existing experimental machine design to achieve a unit capable of commercial production. A new resin, "Teflon" 100X perfluorocarbon resin, which is melt extrudable has been developed by the Polychemicals Research Division. The maximum service temperature of this resin is about 100°F lower than the other forms of "Teflon". Should the decision be made to produce this material a commercial plant would not be in operation before 1959.

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The extrusion process, often called paste extrusion, is considered to be one of the best processes for applying thin wall insulations of "Teflon" on wire. A number of companies have been in commercial production of wire insulated with "Teflon" via this extrusion process for several years. The basic factors of the extrusion process are being studied within the Polychemicals Department of the du Pont Company. This paper de-

* Registered U. S. Patent Office.

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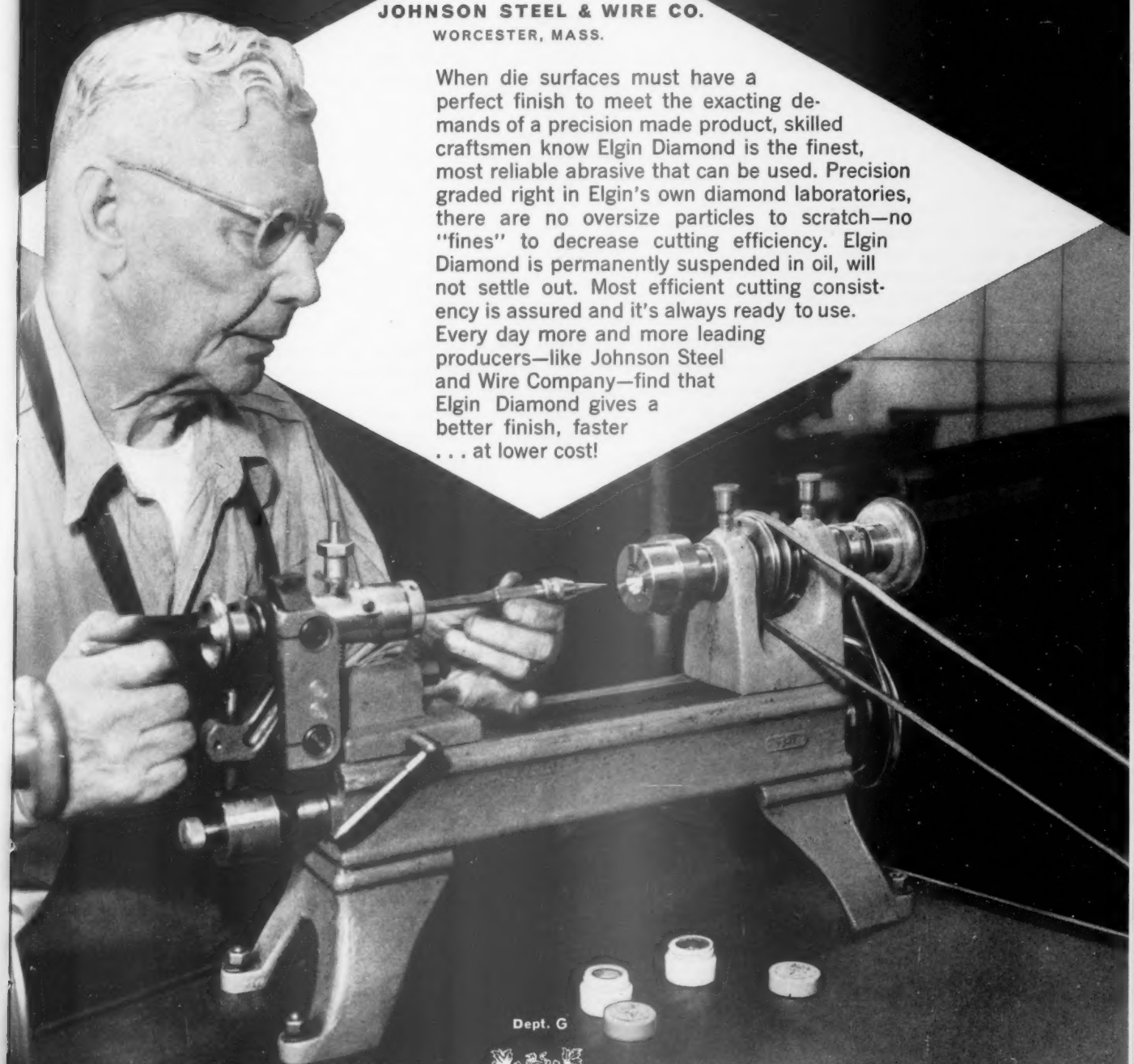

Dept. G

ABRASIVES DIVISION

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS

scribes the result of the process study to date with emphasis on practical limits of operation and systematic methods of solving fabrication problems.

Rheological Behavior of "Teflon" 6

"Teflon" 6 is an extrusion grade resin having an ultimate particle size of approximately 0.2 microns. Unlike the granular "Teflon" resins used for molding, it is capable of undergoing large plastic deformations when subjected to moderate stresses. When "Teflon" 6 is forced through a conical die the individual particles are elongated into fibers which are considerably stronger than the "Teflon" charged to the die (4). The characteristic work strengthening of "Teflon" 6, due to the elongation of the "Teflon" particles, is the heart of the extrusion process. By virtue of this property a billet or a preform made from the extrusion powder having a low tensile strength of only a few lb/sq. in. can be converted into an extrudate having a yield strength of several hundred lb/sq in. A hydrocarbon oil lubricant is mixed with the resin prior to extrusion. The concentration of oil is adjusted to permit the extrusion of a strong extrudate at reasonable pressures.

The Wire Coating Process

The wire coating process resembles the cold extrusion of metals, except that unlike metal extrusion, extremely large area reductions are possible; in fact, area reductions of over 1000:1 are common. Area reduction, referred to in this paper as reduction ratio, is defined in Figure 1. Die dimensions are used rather than extrudate or product dimensions, as the latter are dependent on process variables.

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Typical wire coating equipment is shown schematically in Figure 2. The "Teflon" extrusion powder is mixed with a lubricant, performed to the shape of the extruder cylinder, and placed in the extruder cylinder. The wire is introduced into the extruder cylinder through a wire guide tube and a guide tube tip. The wire is coated with polymer at a point near the top of the conical die as pressure is applied to the preform by a ram. The extrudate passes through an oven heated to 350 to 575°F, where the lubricant is volatilized. It then passes through a second oven heated to 650 to 750°F, where the coating is sintered or fused. The capstan, wind up, pay-off, and spark-testing equipment used are standard wire coating equipment. A simple device such as a spring balance for measuring wire tension and equipment for measuring extrusion pressure are useful accessories for process studies.

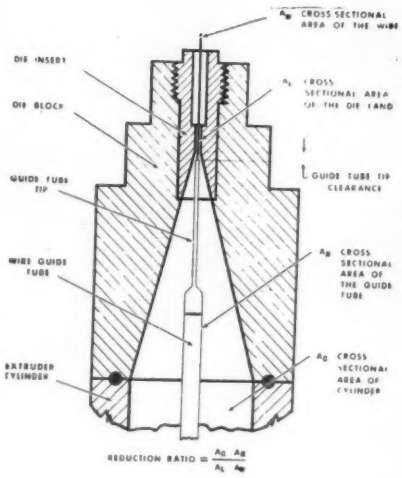

FIGURE 1 DEFINITION OF REDUCTION RATIO

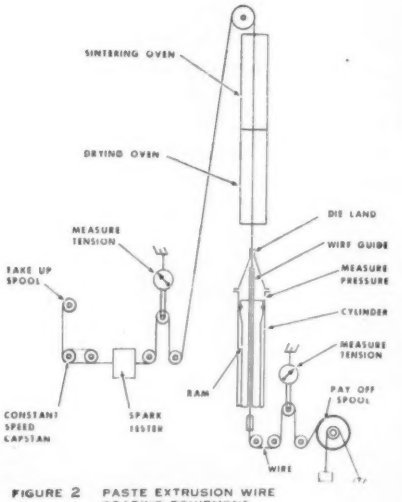

FIGURE 2 PASTE EXTRUSION WIRE COATING EQUIPMENT

Handling of the Extrusion Powder

Prior to extrusion, "Teflon" 6 requires careful handling procedures to prevent excessive particle deformation. Scooping of the powder, excessive screening, or any other mechanical deformation of the powder causes sufficient damage to render the particles less suitable for paste extrusion. These deformed particles tend to resist the further deformation required in the extrusion die and cause flaws in the wire coating. Care should be taken during the handling procedures to avoid contamination, which could lead to coating flaws.

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During shipping and storage, "Teflon" 6 will at times become compacted. This can be minimized by storing the powder at temperatures below 70°F. Should compaction occur and the lumps fail to break up during a mild screening, the lumps should be impact-screened at 50 to 63°F on a 4-mesh sieve. This procedure results in a powder which will be suitable for use.

Preparation of the Lubricated Compound

A very important step in preparing the powder for extrusion is the incorporation of a lubricant. The function of the lubricant in extrusion is to wet the polymer particles, allowing the formation of a paste which can be extruded through a die into various shapes at low pressures. Any organic liquid which will wet "Teflon" can be used as a lubricant provided it meets the requirements implied by the extrusion conditions (4). VM&P grade naptha[1] is recommended as a lubricant as it is easy to incorporate into the resin, vaporizes completely and rapidly below the sintering temperature (621°F) of the resin, and leaves little or no carbon residue when vaporized. Number 30 white oil[2] is also used as a lubricant by some processors.

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The following step-wise procedure is recommended for incorporating the lubricant. The powder should be held at 70 to 80°F during this procedure.

(1) Screen the powder as received in the shipping container through a 4-mesh sieve onto a clean, lint-free, dry sheet of paper.

(2) Transfer a predetermined weight of the screened powder to a clean, dry container having an airtight closure. For example, a one-gallon wide-

mouth glass bottle having a metal-foil-lined closure is suitable for a 1000 gram batch of "Teflon."

(3) Add the required amount of lubricant, naphtha, to the "Teflon" in the container. Care should be taken here to prevent the lubricant from wetting the walls of the container, as this hampers the mixing action. The screw-type closure should be taped in place to prevent any loss of lubricant. The ingredients should be weighed with a precision of at least ±0.2%.

(4) Shake the container briefly to minimize the wetting of the container wall with liquid.

(5) Place the container on a pair of parallel horizontal rollers which are driven in the same direction at 15 rpm. Allow the container to roll for 15 to 20 minutes. Caution: Do not allow the container to roll for extended periods of time, as this tends to work the "Teflon" particles excessively.

(6) Remove the container from the rolls and age the compounded mixture overnight in the sealed container at room temperature to enable the lubricant to diffuse to the interior of individual particles and surfaces not reached during the rolling process.

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The optimum concentration of the lubricant in the compounded mixture is dependent on the extrusion die design, the extruder cylinder diameter, and the wall thickness of the wire insulation applied. Normally the lubricant comprises from 17 to 20% of the total weight of the compounded mixture.

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Colored wire coatings can be made by adding various pigments to the compounded mixture. The pigments should be thermally stable at "Teflon" processing temperatures, have a particle size not larger than that of "Teflon" 6. and not tend to agglomerate. Pigment concentrations of 0.1 to 0.3% produce a satisfactory depth of color. The pigment is dry blended with the "Teflon" powder prior to the addition of the lubricant.

Preparation of the Preform

The object of preforming is to press the loose compounded mixture of "Teflon" and the lubricant into a solid cylinder which may be charged into the extruder cylinder. The preform is made by compacting the lubricated "Teflon" mixture in a smooth-finish preform cylinder having a core rod in its center.

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The cylinder is about three times as long as the finished preform to allow for the volume reduction of the lubricated "Teflon" The outside diameter of the preform is approximately 50 mils less than the diameter of the extruder cylinder. The core rod diameter is about 10 mils larger than the diameter of the wire guide tube in the extruder cylinder.

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When the lubricated "Teflon" is poured into the preform cylinder care should be taken to distribute the powder evenly around the core rod. This insures an even compaction of powder throughout the finished preform.

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The effect of preforming pressure on the preform density was determined by measuring the pressure developed on the preforming ram during compaction of the lubricated "Teflon". The rate of travel of the preforming ram was 0.5 in./min to prevent excessive shear stresses in the polymer and to allow the entrapped air to escape. The result of this work is illustrated graphically in Figure 3, from which it is apparent that pressures in excess of 100 lb/sq in. do not affect preform density. In

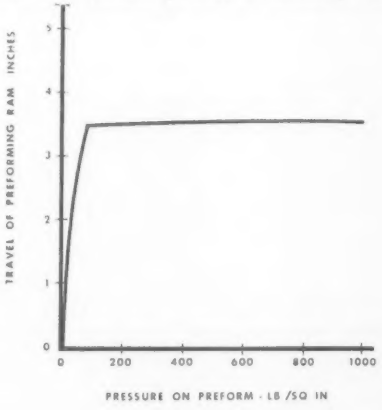

FIGURE 3 PRESSURE DEVELOPED DURING CONSTANT SPEED PREFORMING AT 0.5 IN./MIN

wire-coating operations there was no difference in the extrusion performance of preforms made at 50 to 100 lb/sq in. and those made at 1000 lb/sq in. Thus, preforming pressures of 50 to 100 lb/sq in. are sufficient for preforming. In fact, higher pressures are less desirable as lubricant is squeezed out of the preform.

The quality of the coated wire depends greatly on the preparation and handling of the preform. Care should be taken to avoid any deformation or contamination of the preform when removing it from the preform cylinder and inserting it into the extruder cylinder. Finished preforms should not be allowed to stand exposed to air before using because the lubricant volatilizes, leaving the preforms too dry for extrusion.

The Extruder Cylinder and Ram

Various diameter cylinders are used in the extrusion of "Teflon" for wire insulation. Normally, the diameters range from ¾" to 2½", the smaller diameter cylinders being required for the smaller wire sizes. The ram is driven by a screw jack mechanism which enables a constant thruput of material regardless of extrusion pressure. This constant thruput of material is required to insure good caliper control of the extrudate. A variable speed mechanism drives the ram and allows displacement speeds up to 6 lb/hr of lubricated "Teflon". The extruder cylinder and ram should be able to withstand extrusion pressures of 30,000 lb/sq in.

Reduction Ratio[1]

The work of extrusion is mainly expended in a non-recoverable plastic deformation of the particles of "Teflon". Thus for a given reduction ratio the extrusion pressure will be practically independent of the flow rate of the lubricated polymer and directly dependent on the particle deformation imposed. Figure 4 shows the relatively small change in pressure with increased flow rates at various reduction ratios. When other extrusion variables were held constant the extrusion pressure was found to be proportional to the reduction ratio as shown in Figure 5. These measurements were made with both a rheometer[2] and a wire coating machine. Also, as illustrated in Figure 6, the tensile strength of the ex-

[1] As defined in Figure 1.

[2] The rheometer is a small ram type extruder which is equipped to extrude a solid cylindrical extrudate at either constant pressure or at a constant ram displacement rate. Pressure and ram displacement can be controlled and measured precisely.

trudate is proportional to the extrusion pressure. This is noted by the measurement of the yield stress of "Teflon" 6 beading extruded at various pressures.

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In practice, successful fabrication is limited by the upper and lower extremes of reduction ratio. At reduction ratios of 2,000 to 3,000 fracture of the polymer may occur in the die resulting in an extrudate sheared into discontinuous pieces. At reduction ratios around 100, the particles are so lightly compressed that particle boundaries are not eliminated on fusion. These limits also depend on the lubricant concentration and the application in question, and are therefore not clearly definable.

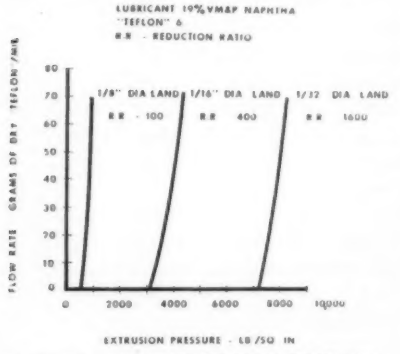

FIGURE 4 FLOW RATE VERSUS PRESSURE FOR BEADING EXTRUSION IN A 1 1/4" DIAMETER RHEOMETER WITH 30° ANGLE DIE

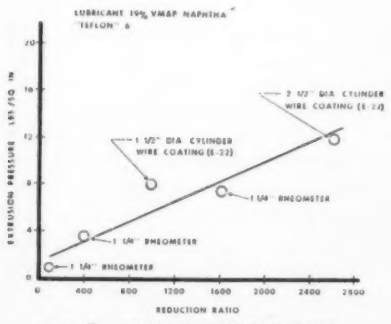

FIGURE 5 CHANGE IN EXTRUSION PRESSURE WITH REDUCTION RATIO

The Die

The function of the die used in extrusion is to convert the rather weak lubricated preform into a strong fibrous extrudate coating on the wire having the desired wall thickness. The variables affecting the die performance are: the included angle of the die cone, the diameter of the die land, the length

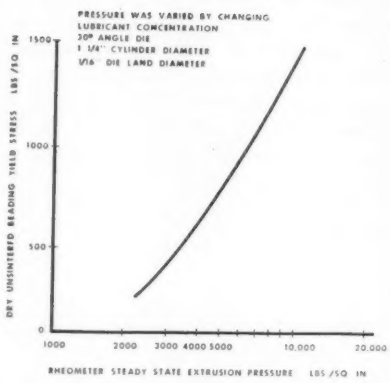
PRESSURE WAS VARIED BY CHANGING LUBRICANT CONCENTRATION
30° ANGLE DIE
1 1/4" CYLINDER DIAMETER
1/16" DIE LAND DIAMETER
DRY UNSINTERED BEADING YIELD STRESS LBS /SQ IN
RHEOMETER STEADY STATE EXTRUSION PRESSURE LBS /SQ IN

FIGURE 6 RHEOMETER EXTRUSION PRESSURE VERSUS BEADING YIELD STRESS

of the die land, and the temperature of the die during extrusion.

★ ★ ★

The included angle of the die cone affects the extrusion pressure and the smoothness of the extrudate. Die angles in excess of 60° appear to be impractical for wire coating owing to the high extrusion pressures developed. Die angles of less than 15° are objectionable because of the large hold-up of material in the die taper and high cost of die fabrication. From experimental extrusion studies we have noted a progressive improvement in the extrudate smoothness with reduction of die angle.

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The 20° included angle die is currently the most popular die, particularly for thin-wall hook-up wire fabrication. Dies having an included angle of 30° are also used sucessfully for thicker wall insulations such as coaxial cable core.

★ ★ ★

As the extrudate leaves the die land a relaxation of the elastic strains in the extrudate occurs. This causes the outside diameter of the extrudate to be larger than the extrusion die land diameter. The size of the die land diameter serves to control the amount of elastic strain relaxation.

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To estimate the die land diameter for a given wire coating application, a knowledge of the desired extrudate diameter is necessary. The extrudate diameter required for a given product diameter is dependent on the lubricant concentration, the crystallinity change in the polymer during sintering and the conductor diameter. The extrudate diameter can be calculated to ± 1 mil by using equation (1) which was derived for the extrusion of "Teflon" 6 using #30 white oil or VM&P naphtha as a lubricant. The extrudate diameter is related to the volumetric displacement rate of the ram and the wire coating speed by equation (2). Where:

$$\frac{D_E^2 - D_W^2}{D_p^2 - D_W^2} = 0.944 + 2.85\,\frac{X}{1-X} \qquad (1)$$

$$V_R = \frac{3\pi}{10^6}\,(D_E^2 - D_W^2)\,S_W \qquad (2)$$

where:

D_E = extrudate diameter in mils
D_P = product diameter in mils
D_W = conductor diameter in mils
X = lubricant concentration in grams per gram of lubricated "Teflon"
V_R = volumetric displacement rate of ram - cu in./min
S_W = wire coating speed in ft/min

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Both equation (1) and (2) are presented as a nomograph in Figures 7 and 8 which can be used for rapid calculations. Having established an extrudate diameter for a given product diameter and a given lubricant concentration determined by experience, one can estimate the die land diameter from Figure 9. Figure 9 was constructed from experimental data taken during the wire coating of various wire constructions. The amount of elastic relaxation or "blow-up" of the paste permitted at the die land exit is reduced as the reduction ratio is increased. If the "blow-up" is not reduced by using as large a die land diameter as possible at high reduction ratios, excessive extrusion pressures will be developed.

★ ★ ★

During experimental rheometer extrusion studies a marked visual improvement in the surface smoothness of the solid extrudate was observed as the die land length was increased up to one inch. This suggests that a die land length of one inch would produce a smooth surface extrudate in wire coating. This, however, is not true in wire coating because additional shear is present due to the wire which causes the extrudate coating to tear. In practice, die land lengths from ¼" to ½" have been found to produce an extrudate coating

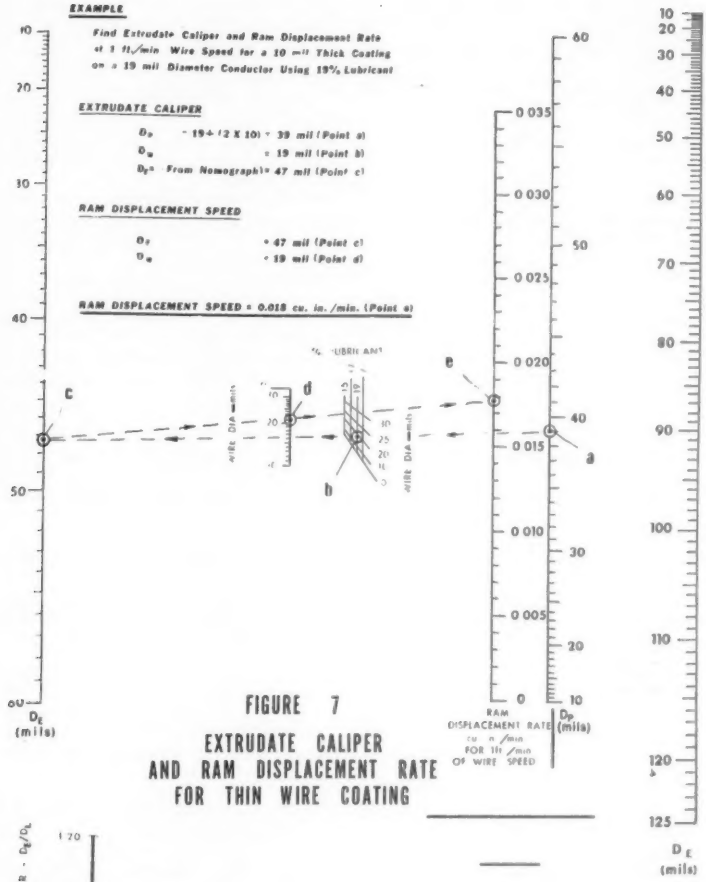
EXAMPLE
Find Extrudate Caliper and Ram Displacement Rate at 1 ft/min Wire Speed for a 10 mil Thick Coating on a 19 mil Diameter Conductor Using 19% Lubricant
EXTRUDATE CALIPER
RAM DISPLACEMENT SPEED
RAM DISPLACEMENT SPEED = 0.018 cu. in./min. (Point e)
% LUBRICANT
WIRE DIA-mils
RAM DISPLACEMENT RATE cu in/min FOR 1 ft/min OF WIRE SPEED
D_E (mils)
D_P (mils)

FIGURE 7

EXTRUDATE CALIPER AND RAM DISPLACEMENT RATE FOR THIN WIRE COATING

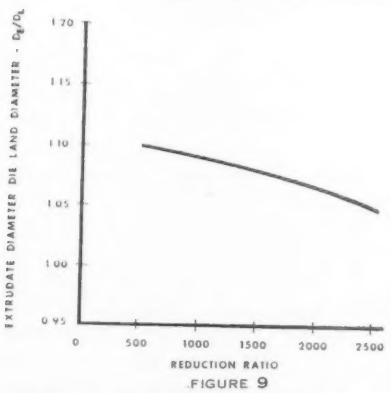

FIGURE 9

RECOMMENDED RATIO OF EXTRUDATE DIAMETER TO LAND DIAMETER VERSUS REDUCTION RATIO

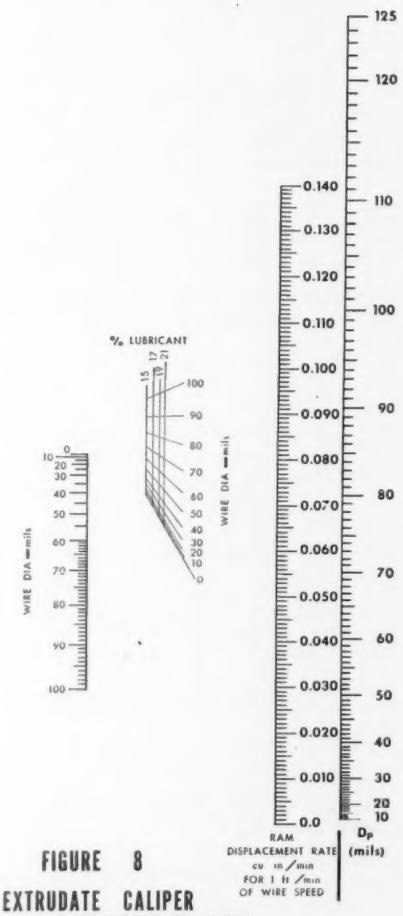

FIGURE 8

EXTRUDATE CALIPER AND RAM DISPLACEMENT RATE FOR THIN WIRE COATING

having the smoothest surface possible free from tears.

★ ★ ★

The temperature of the die during extrusion should be maintained above 75°F. Below 75°F the extrudate coating becomes rough and worthless. This effect is believed to be associated with the room temperature transition of "Teflon" (6). Normally die temperatures of 75 to 140°F are sufficient to produce satisfactory extrudates. Added temperature has little effect on the extrudate quality; however, it does increase the extrusion pressure slightly. Die heating also aids the drying operation by preheating the extrudate, which increases the rate of diffusion of the lubricant to the coating surface where it can be vaporized.

The Guide Tube Tip

The purpose of the guide tube and guide tube tip is to provide a guide for the wire through the extruder cylinder to the entrance of the die land. The clearance between the die land entrance and the guide tube tip can be varied to control the length of wire exposed to the lubricated polymer in the die.

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When the clearance between the tip and the die land is properly set the average velocity of the lubricated polymer in this area is the same as the wire speed. If the clearance is too large, the polymer speed is slower than the wire speed which causes excessive shearing of the polymer particles in contact with the wire. This shearing action increases the wire tension enough to cause a wire failure and causes numerous coating flaws. Should the clearance be too small, the guide tube tip tends to plug the die, causing high extrusion pressures. This plugging action causes surging of the lubricated polymer around the wire, resulting in rough, discontinuous coatings.

★ ★ ★

The guide tube tip clearance also determined how tightly the coating adheres to the wire. In general, the smaller the clearance, the looser the coating on the wire. When extruding heavy wall coatings (thickness greater than 15 mils) the die land diameter is usually greater than the outside diameter of the guide tube tip. If the clearance is

TABLE IV

"TEFLON" WIRE COATING PROCESSING DIFFICULTIES AND THEIR REMEDIES

DESCRIPTION	SOURCE	REMEDY
High tension in wire, paste extruding back into guide tube tip.	Guide tip clearance too large.	Decrease guide tip clearance until the wire tension is $<$ 5 lbs., use Table III as a guide.
Excessive extrusion pressure, polymer released from die in surges, wire sags above the die.	Guide tip clearance too small and tip partially plugs polymer flow to die land.	Increase guide tip clearance until surging vanishes, use Table III as a guide.
Extrudate coating on wire rough, corrugated or buckled.	a) Die land diameter too small. b) Ram speed too fast. c) Wire speed too slow.	a,b,c) Calculate die diameter, wire and ram speed for fabrication. Use Figures 7, 8, and 9. b,c) Adjust ram and wire speed to produce the proper diameter extrudate.
Wire off center in coating, polymer extrudes preferentially on one side of the die.	a) Die land diameter too large. b) Wire guide tube or guide tube tip is bent and off center. c) Wire and ram speed not properly adjusted.	a,c) Calculate die diameter, wire and ram speed for fabrication. Use Figures 7, 8, and 9. b) Straighten or replace bent tube or tip.
Extrudate surface rough and irregular in shape.	Die land too short.	Increase die land length, recommended length ¼" to ½".
Extrudate surface smooth, however, occasional tears in coating occur exposing conductor.	Die land too long.	Shorten die land length, recommend length ¼" to ½".
Extrudate very fibrous, extrusion pressure very high, possible machine stalls.	Concentration of lubricant too low.	Increase lubricant concentration in range of 17 to 20%. Check preforming operation to prevent any loss of lubricant prior to charging the preform into the machine.
Extrudate rough and weak, lubricant squirts from the die.	Concentration of lubricant too high.	Decrease lubricant concentration in range of 17 to 20%.
Extrusions are always unsatisfactory because of excessive extrusion pressure, high wire tension, or spark failures. No practical setting of conditions do any good.	a) Reduction ratio too high. b) Included angle of the die too large.	a) Reduce the reduction ratio by using a smaller extrusion cylinder. b) Use a die having a smaller included angle.
Excessive spark failures, a) Rough extrudate.	a) Due to any of above sources.	a) The above listed remedy for corresponding source.
b) Smooth extrudate.	b) Drying oven temperatures too high. c) Coating entering the sintering oven still containing lubricant.	b) Keep drying temperatures below 575°F. c) Decrease wire speed if drying ovens at maximum temperature. If not at maximum temperature, increase the drying oven temperature.
Excessive spark failures in coating at higher wire speeds when all conditions are set properly. Acceptable coating at lower speeds.	Mechanical stressing of the coating when it is at the sintering temperature (621°F).	Allow coating to cool sufficiently $<$ 400°F. after exit from the sintering ovens before flexing it over sheaves.
Wire persistently snags before entering guide tube tip.	a) Insufficient braking at the wire pay-off. b) Faulty stranding of the wire.	a) Increase braking at the pay-off. b) Use a good grade of concentric stranded conductor having a lay of 1/3 or tighter.
Product coating has an opaque white appearance.	The coating is insufficiently sintered.	Raise the sintering oven temperature or reduce the wire coating speed.
Product coating transparent and has a dark brown or is opaque and a dull grey.	The coating is over-sintered.	Reduce the sintering oven temperature or increase the wire coating speed until the coating is slightly opalescent, almost colorless, and flexible.
Coating shreads at the die.	Die or polymer too cold during extrusion.	Maintain a die temperature of 70°F. to 140°F.
Random coating flaws, mechanical and electrical breaks.	Contamination of the polymer—overworked particles, dirt, dust, etc.	Keep contamination at a low level during blending and preforming.

too small or the guide tube tip is up in the die land it is possible to extrude a flow free tubing over the wire which has no adherence to the wire.

★ ★ ★

When applying thin wall insulation, the guide tube tip clearance is very critical. This setting is much less critical as the wall thickness of the insulation increases. Actual setting of the clearance usually involves a trial and error procedure for each type of wire coating application. Typical optimum guide tube tip positions for common coating applications are illustrated in Table III.

TABLE III

DATA FOR GUIDE TIP POSITIONING

Wire Type	Coating Thickness mils	Cylinder Dia. in.	Reduction Ratio	Land Dia. mil	Guide Tip Clearance mil	Limitations
E-22	8-12	2½	2510	58	13	Tension too high if tip lower
EE-22	13-17	2½	1661	68	18	Tension too high if tip lower
Coax Core	40	2½	644	100	130	Loose coating if tip higher Pressure and tension both low and not important in this case.
E-22	8-12	1½	978	56	25	Pressure too high if tip higher. Position for min. coating flaws.

Drying and Sintering

The "Teflon" extrudate as it leaves the extrusion die contains about 19% by total weight or 40% by volume of naphtha lubricant. In the drying oven this lubricant diffuses to the surface of the coating and is vaporized. It is important that all the vaporization of the lubricant take place on the coating surface to prevent vapor cracking. The rate of diffusion and vaporization is controlled by the drying oven temperature. Drying oven temperatures generally used are about 300°F at the entrance up to 575°F at the exit.

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During drying operations the oven should be exhausted sufficiently to keep the naphtha fume concentration below 0.9%. This is to insure adequate protection from fire.

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The coating as it leaves the drying oven is very porous. The forces of coalescence in sintering are strong enough to eliminate these voids at the expense of a reduction in the coating diameter. A transition temperature of 621°F must be attained for a few seconds by the coating to effect this sintering. While the "Teflon" is in the gel state (621°F) it should not be submitted to stresses. To enable the coating to be sintered properly the sintering oven is maintained at 700-750°F.

★ ★ ★

The sintering oven should also be supplied with an exhaust system to remove possible trace quantities of toxic fumes given off during sintering or from coated wire left inadvertently in the hot ovens.

When using the recommended oven temperatures, 300 to 575°F for drying and 700 to 750°F for sintering, approximately one-half of the total oven length should be used for drying. The oven capacity is in most cases the factor which limits the wire coating speed. For example, a 20 foot oven limits the coating speed of type E-22 wire to less than 30 ft./min. The limiting coating speed of any given fabrication for a fixed oven length can be determined by varying the coating speed until the product is properly sintered. When the natural product has an opaque white appearance it is insufficiently sintered and when it is a transparent dark brown, or a dull grey it is over sintered. Properly sintered natural material is slightly opalescent, almost colorless, and flexible.

★ ★ ★

The actual temperature of the wire as it passes through the ovens can be traced by coating a length of iron wire and a length of constantan wire, butt joined together. This serves as a traveling thermocouple which when connected to a potentiometer indicates the temperature of the wire under the "Teflon" coating at any oven position. The oven temperature profile so obtained is useful in setting oven temperatures to obtain an efficient use of the entire oven capacity. Figure 10 illustrates a typical trace made with a thermocouple having the same dimensions as Type E-22 hook-up wire.

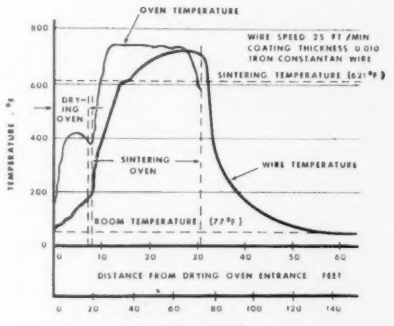

FIGURE 10 OVEN TEMPERATURE TRACE

Drying and sintering rates can at times be increased by increasing oven temperatures. Temperatures in excess of those recommended for the drying ovens often cause flaws in "Teflon" coating. Higher temperatures in the sintering ovens can be used provided the coating temperature does not exceed 720°F. Above 720°F degradation of the "Teflon" coating begins to take place.

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Typical ovens used commercially consist of long metal pipes 1" or 2" in diameter which are heated by electrical coils, strip or band heaters. The wall temperatures of these ovens should be controlled and measured to ± 10°F at intervals along the oven length.

★ ★ ★

During the experimental wire coating process studies a number of processing difficulties were noted which can be remedied quite easily. Table IV summarizes our experience in "trouble shooting" the wire coating process.

Summary

The purpose of our study of "Teflon" 6 extrusion, sometimes re-

(*Please turn to page* 713)

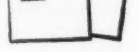
COMPLETE, CONTINUOUS WIRE INSULATING SYSTEMS

for

PLASTIC JACKETING
WIRE ENAMELING
CABLE LACQUERING
GLASS and VARNISH INSULATING

FRICTION LETOFFS
DRIVEN LETOFFS
TENSION CONTROL STANDS
CAPSTANS
CONTINUOUS WINDUPS
STRAIGHT AND RETURN-BEND COOLING TROUGHS
CONVECTION AND RADIANT HEATED TOWERS
SYSTEM DRIVES

Write for descriptive literature, specifications, and complete detailed information.



INDUSTRIAL OVENS, INC.
13807 TRISKETT ROAD
CLEVELAND 11, OHIO

Wire Production from Refractory Copper-Base Alloys

In this article are described some of the non-ferrous extruding and drawing operations at the Riverside Metal Works of the Riverside-Alloy Metal Division of H. K. Porter Co., Inc., which recently underwent a modernization and expansion program.

Refractory copper-base alloys are usually considered specialty items for a brass mill; but, at the Riverside Metal Works, they are the stock in trade.

★ ★ ★

Webster defines the word 'refractory' as: '1. Stubborn; unmanageable. 2. Difficult to melt, reduce, or the like, as some ores.' When certain copper-base alloys are referred to as 'refractory', difficulty of reduction is the part of this definition that is most apt. In particular, refractory copper-base alloys are those which resist normal methods of working. In the case of most of the bronzes and nickel silvers that are produced in the plant, reduction in size is usually achieved only by cold working, since these alloys are 'hot short' and will break apart at hot-rolling temperatures. The mill is therefore essentially a cold' mill, where alloys are alternately reduced to smaller sizes then annealed to relieve the stresses built up by the reduction.

★ ★ ★

The manufacturing facilities at Riverside can be divided into two main categories—the rolling mill, where alloys are produced in the forms of sheet and strip, and the wire mill, where round wire, flat wire and rods are made. Manufacturing procedures in the two departments are similar in most aspects with one notable exception—the first operation performed in the wire mill after the billets are received from the casting shop. Instead of the initial reduction being by cold work (as it is in the rolling mill), for wire and rod production, the alloys are heated and put through an extrusion press—a procedure developed that results in material of much higher quality than that produced by conventional methods. Uniformly consistent structure and greater density are two of the outstanding advantages; but the most important difference is that sounder metal, free from internal and external defects, is obtained by the extrusion process.

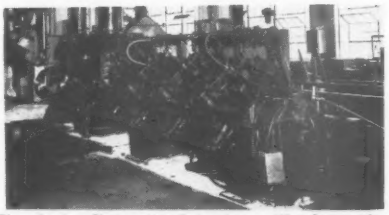


Fig. 3—Small ten-stand tandem mill where wire is rolled from 0.330 square to 0.160 square. * *

★ ★ ★

Following extrusion, the procedure of alternate cold reduction and annealing is begun, the machinery on which this is done being determined by the specifications for the finished sizes. For the larger sizes of wire and rod, the first reduction is performed on 3-Hi rod rolls, where the metal is reduced to 0.640″ square. For the smaller finished sizes, this operation is carried out on 10-stand tandem mills where the metal is taken down to 0.330″ square before being annealed.

★ ★ ★

The first anneal is in an 85-foot, atmosphere-controlled, roller hearth furnace, which accommodates 4,000 pounds of wire per hour and is operated on a continuous, round-the-clock basis. After this anneal, further reduction is accomplished on small 10-stand tandem mills or on wire-drawing blocks. The wire is reduced as low as 0.128″ in diameter before it is sent again to the annealing furn-

(*Please turn to page* 708)

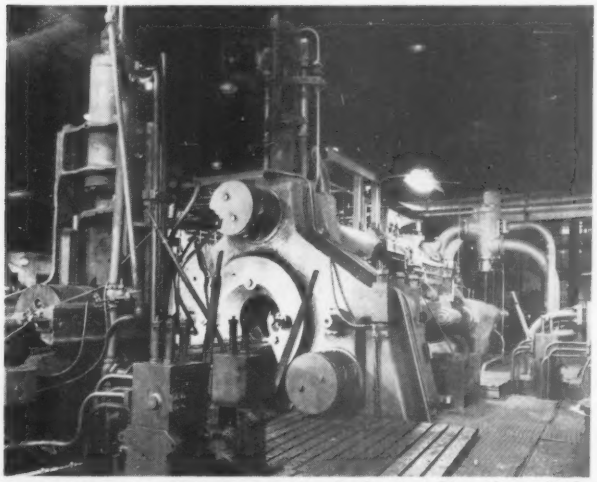


Fig. 1—Extrusion of billets by a process developed at Riverside results in wire and rod with greater soundness and density and more uniformly consistent structure than metal produced by conventional methods. * * *

Fig. 2—Eighty-five foot roller-hearth furnace provides continuous controlled-atmosphere wire annealing to maintain specific mechanical properties or to soften metal for further drawing. * * * * * * *

Improvements in Stranding of Insulated Wires

by H. Otto Haugwitz, Engineer
Attache to the General Manager
Ste. Geoffroy-Delore
Paris, France

This article describes an improved and more economical double twist laying-up machine and a comparison of it with other categories of stranders.

To cut the costs of manufacturing while improving the quality is the first aim of all cable-makers, but rarely do we find nowadays a new process permitting a substantial diminution of the price of the finished product. One has therefore to content oneself with finding and applying measures to improve partial operations of manufacturing which have only a relatively small influence on the final prices, under the only condition that its rentability is guaranteed by itself.

★ ★ ★

There are unexpected potentialities that make possible improvements in operations, where changes had not been made for a long time because the existing machines did not allow it, or because old habits were ingrained.

★ ★ ★

In the following lines is given an example of how this has been done in the Clichy plant of the Cablework Geoffroy-Delore, Paris, an important development, a classic operation, practised for a long time on an extensive scale: the laying-up of 2 to 4 insulated wires with sections of copper up to 22 mm² (0.034 sq. in.) per conductor.

★ ★ ★

First of all, a short summary of the existing methods and machines with their properties is given.

The Principal Methods of Laying-Up and Their Advantages

Four different laying-up processes and types of laying-up machines are known, shown schematically in Fig. 1.

A. Laying-Up Machines with Cages

The conductors to be laid-up are wound on drums put in a cage in rotation, in which the haulage device and the take-up are stationary.

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The stranding is made with or without release of torsion.

★ ★ ★

The rotation speed of these machines is relatively slow and very seldom over 100 rev/min and it must be still slower, when the diameter of cage drums becomes bigger.

★ ★ ★

The machines generally have grouped vertical axes (Fig. 1 Ib), but for cage drums over a certain diameter they have horizontal axes. (Fig. 1 Ia).

★ ★ ★

Advantages: With a take-up stationary on the ground the diameter of the drum is not limited. Very long lengths can be wound up. The changing of the drums is easy and rapid.

★ ★ ★

Disadvantages: Speed slow; output therefore small. The conductors to be stranded, first of all those manufactured on extruding machines, with or without continuous vulcanizing, are wound in great lengths on a drum of large diameter or in barrels. The cage drums are generally smaller than those of the take-up of the preceding machines. The wires have therefore to be wound on the cage drums in an additional operation before stranding.

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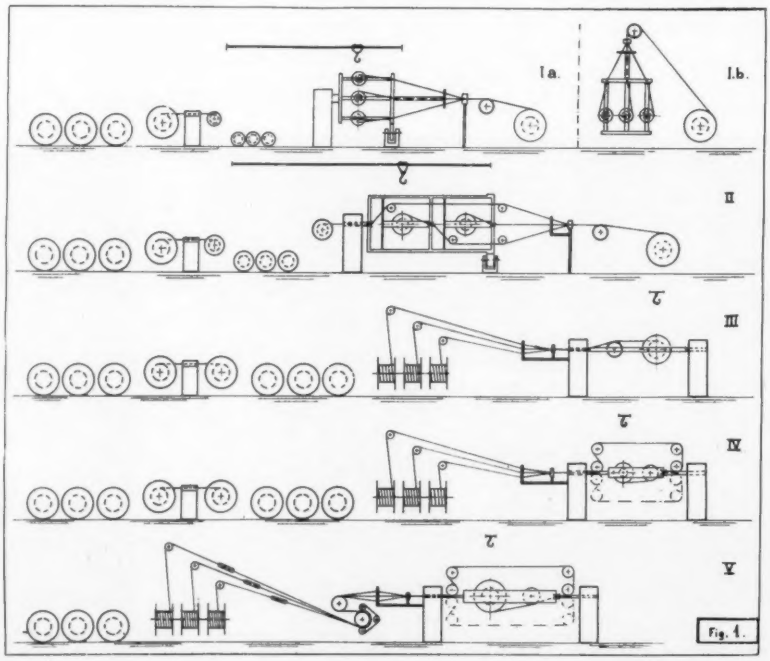
The conductors have also generally to be spark-tested and faults repaired before stranding. This operation is often done separately,



but it can be done whilst the core is wound on the other drum.

★ ★ ★

The charging of the cradles with full drums by means of pulley-blocks takes relatively a good deal of time.

★ ★ ★

The adjustment of the individual brakes of the cradles to ensure a perfect symmetry of stranding is difficult.

B. Tubular Laying-Up Machines

The cores to be stranded are wound on drums suspended in cradles arranged in a straight line inside of a rotating tube. The cores are guided in such a manner, that they turn the following cradles on to the stranding point. The haulage device and the take-up are stationary on the ground (Fig. 1, II).

★ ★ ★

Most people believe that stranding is made with release of torsion in these machines, but this is not the case, since the deviation angles of the wire in these guides are never small enough to prevent the wire being driven by the rotation of the tube. In reality, the wires are torsionned more or less at the exit of their cradles and retorsionned more or less at the stranding point, so that they are finally nearly in their original position as if stranded without torsion; but as a matter of fact, they have been torsionned twice in opposite direction.

★ ★ ★

The tubular laying-up machines adapted for insulated wires are rather fast, up to 500 r.p.m., but the speed must be reduced when bigger drums are used and also for greater lays, because a haulage speed over 100 m/min (300 ft/min) risks damage to the insulation and creates faults.

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Advantages: High speed, great output. Diameter of take-up drum not limited, its changing is rapid and easy.

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Disadvantages: Special operation necessary to rerun the cores on other drums. For the changing of drums and symmetry of stranding the conditions are the same as in case A.

C. Single Twist Spinning Machine (rarely used)

The haulage device and take-up of these machines are mounted together in a rotating cradle. The wires to be stranded come from supply stands, drums or barrels stationary on the ground (Fig. 1, III).

★ ★ ★

The stranding is made without release of torsion, but the drums could eventually be placed in cradles, revolving in the same direction and at the same speed as the cradle take-up, and in this case the release of torsion is obtained.

★ ★ ★

The rotating speed is generally a little higher than those of stranding machines with cages, but much slower than those of tubular laying-up machines. It diminishes also with greater diameter of the take-up drum.

★ ★ ★

Advantages: The take-up drums or barrels of the preceding machines can supply the spinning machine directly. The change-over of drums and barrels is rapid. The tests and the repairing can be made in one operation with stranding.

★ ★ ★

Disadvantages: The diameter of the take-up drum is limited by the dimensions of the cradle. Its charging by means of a pulley-block is not very fast.

D. Flyer Strander (Double Twist Spinning Machine)

The haulage device and the take-up drum are placed in a cradle immovable in space. The conductors to be stranded come from supply stands, drums or barrels, stationary on the ground, pass through a flyer revolving around the cradle, and they are torsionned at each revolution of the flyer, once at the entrance of the flyer, and a second time at the entrance of the cradle (Fig. 1, IV).

★ ★ ★

On one hand, these machines can run faster than all the others because of the small masses in motion. On the other hand, they make two lays per revolution of the flyer, which doubles the output for an equal number of revolutions.

★ ★ ★

The stranding is made without release of torsion of the cores.

★ ★ ★

At the time the problem was attacked 5 years ago, flyer-stranders, especially for insulated wires over a certain section, were not known. In the existing machines neither the diameter of the take-up drum, nor the radius of the pulleys in the flyer were great enough.

★ ★ ★

Advantages: Speed and production very high. The take-up drums or barrels of the preceding machines can be used directly. Its changing is easy and rapid. Tests and repairing can be made in one operation with stranding.

★ ★ ★

Disadvantages: The diameter of the take-up drums is limited by the dimensions of the cradle. The charging with the pulley-block is slow. The symmetry of stranding is not ensured.

★ ★ ★

When comparing these four well-known methods, the flyer-strander seems to be the best solution, because it has most of the advantages and the smallest number of disadvantages.

A New and Improved Flyer Strander

Adopting therefore the last method, a new flyer strander has been developed that conserves all of the advantages and eliminates nearly all of the existing disadvantages.

★ ★ ★

This choice was determined by the fact that it had been established that the release of torsion of the wires insulated with rubber or thermoplastics is not necessary at all, and that the torsion of the stranding does not damage the core, when, as is generally the case, the lay is not longer than 20 diameters.

Utilizing a flyer of special design it was possible to increase the diameter of the take-up drum in the cradle up to 1.05m (3′ 5-1/3″), which allows winding rather great lengths on these drums.

★ ★ ★

The increase of the lengths is very important for the succeeding steps of manufacturing, because the waste by fault cuttings is diminished and also down time is often reduced.

★ ★ ★

Thinking that it would not be recommendable to exceed 100 m/min, this speed was chosen as normal constant hauling speed. A lay minimum of 100 mm is thus obtained at 500 revolutions per minute due to the double twist. The longer lays are obtained by reducing at the same rate the number of revolutions of the flyer and by conserving the same hauling speed. The lay maximum is obtained at 100 r/min.

★ ★ ★

The constant output speed permits also an easy calculation of the efficiency of the machine and the cost of labour.

★ ★ ★

To make shorter lays between 60 and 100 mm for special cases, a second hauling speed of 60 m/min. has been provided. 500 r/min corresponds thus to a lay of 60 mm and 100 r/min. to one of 300 mm. The two ranges of lay cover over in the middle between 100 and 300 mm.

★ ★ ★

At these high hauling speeds the risk of stretching the cores, principally those of smaller sections, is great and demands special measures to avoid it.

★ ★ ★

This problem and also that of the symmetry of stranding has been solved by means of a new pre-haulage tension device for the cores to be stranded.

★ ★ ★

The braking of the different cores, rolling off from drums with very often unequal contents, which changes constantly while emptying, is very delicate and calls for frequent adjustment, not easy to control when a constant tension of all wires at the stranding point is desired.

★ ★ ★

In ordinary machines one is not master of the absolute value of the stranding tension. The latter is always the sum of all individual brakings and frictions of each core. The pre-haulage-device of the new machine permits not only equalizing of the individual tensions of each wire, but regulation of the stranding tension independently of the braking of the pay-off bobbins.

★ ★ ★

The pre-haulage device is composed, as can be distinguished in Figures 1 to 3, of a capstan with 4 grooves over which the wires pass. Four individual belts press on the wires and ensure the adherence. The capstan itself is divided into several sectors, which can be moved radially, even when the machine is running, by means of a handwheel. The capstan has therefore a variable diameter. It is driven with the same angular velocity as the main capstan in the take-up cradle.

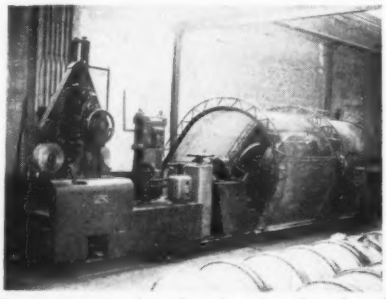

Figure 2. * * * * * * * *

Between the pre-haulage device and the point of stranding, a pulley with four grooves is mounted on a wagon. The cores make a half a wind on this pulley. On the wagon is exerted a horizontal traction by a weight, which determines in a precise manner the stranding tension. If the speed of the haulage device is equal to those of the main capstan, the wagon is immobile. If not, it moves in one direction or the other. It is easy to adjust the diameter of the pre-haulage capstan with the handwheel and to immobilize the wagon, which means that a perfect syncronization is obtained. The difference in diameter between the cores and the stranded cable is also compensated. The stranding obtained in this way is always regular and absolutely symmetrical.

★ ★ ★

Fig. 1 shows the arrangement of the pre-haulage device with the guiding of the cores. The Fig 2 pictures the first machine, in service for 4 years. The extensible capstan can be distinguished with its auxiliary belts.

★ ★ ★

The high output of the machine allows testing of the cores with spark-testers and their repair between the supply stand and the entrance of the machine, so that no more auxiliary operations, transport nor stocking of drums between the testing apparatus and the stranding machine are needed, except for one condition, that the number of faults per km of core is not greater than one, because otherwise the stops would be too frequent.

★ ★ ★

The laying-up machine has therefore been equipped with spark-testers for each core, placed near the pay-off stand, which is at a certain distance of the machine. If a fault is detected, the machine stops automatically and the fault, which has not yet entered into the machine, can be repaired by means of a vulcanizing press. After the repairing, which lasts a few minutes, the machine again is started.

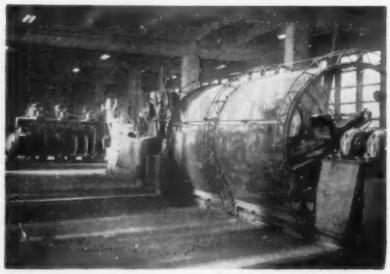

Figure 3. * * * * * * * *

Fig 3 shows the whole equipment. In the background the 4 pay-off stands with the spark testers, the box, containing the electric installation, the vulcanizing press, the pre-haulage device, the flyer, the cradle and finally the protec-

I. TIME, MACHINE AND LABOUR

for 10 Km of cable (3 core) (30 Km of core)

Speed of winding: 2 m/sec; Number of faults: 1 per 3 Km of core

			Type of Stranding Machine							
			New	1 Tubular	2 Tubular	vertical With cage		horizontal With cage		
Winding Tests	Diam.	Pay-off drum	–	1.05m = 3' 5 23/64"	1.05m = 3' 5 23/64"	1.05m = 3' 5 23/64"		1.05m = 3' 5 23/64"		
		Take-up drum	–	0.7m = 2' 3 35/64"	0.81m = 2' 7 57/64"	0.4m = 1' 3 25/32"		0.6m = 1' 11 21/32"		
Stranding	Diam.	Pay-off drum	1.05m = 3' 5 23/64"	0.7m = 2' 3 35/64"	0.81m = 2' 7 57/64"	0.4m = 1' 3 25/32"		0.6m = 1' 11 21/32"		
		Take-up drum	1.05m = 3' 5 23/64"	1.05m = 3' 5 23/64"	1.05m = 3' 5 23/64"	1.05m = 3' 5 23/64"		1.05m = 3' 5 23/64"		
	Revs./Min		between 100 and 500	500	400	120		50		

TIME, MACHINE and LABOUR in minutes

			Mach	Labour	Mach.	Labour	Mach	Labour	Mach	Labour	Mach	Labour
Winding Testing Repairing separately	Cross Section	No of mach served by 1 man		–		2		2		2		2
	3X1 mm²	Running			250		250		250		250	
		Change Pay-off dr			11		11		11		11	
		Change Take-up dr			30		20		90		45	
		Repairing	49	49	49		49		49		49	
		Total time	49	49	340	170	330	165	400	200	355	178
		+( )% for simultaneous stops				(5) 179		(4) 172		(7) 214		(6) 189
	3X10 mm²	Running			250		250		250		250	
		Change Pay-off dr			54		54		54		54	
		Change Take-up dr			150		86		300		225	
		Repairing	49	49	49		49		49		49	
		Total time	49	49	503	252	439	220	653	327	579	189
		+( )% for simultaneous stops				(8) 272		(7) 236		(10) 360		(9) 316
	Average	Total time Mach	49									
		Total time Lab.		49		226		204		287		253
		Coefficient of increase lab		1.0		4.6		4.2		5.9		5.2
Stranding only	3X1 mm²	No of mach served by 1 man		2		2		2		4		2
		Running	100		200		240		720		1820	
		Change Pay-off dr.	–	made while running	68		44		102		51	
		Change Take-up dr.	27		30		30		30		30	
		Welding & repairing at end of lengths	10		30		21		100		50	
		Total time	137		328		335		952		1951	
		+( )% for simultaneous stops	(2) 140		(2) 335	168	(2) 342	171	(2) 971	243	(1) 1970	986
	3X10 mm²	Running	100		90		112		372		894	
		Change Pay-off dr.	–	made while running	274		192		500		170	
		Change Take-up dr.	74		77		77		77		77	
		Binding at end of lengths	10		34		22		100		52	
		Total time	184		475		403		1049		1192	
		+( )% for simultaneous stops	(2) 188	94	(2) 485	243	(2) 412	206	(4) 1090	273	(2) 1220	608
	Average	Total time Mach.	164		410		377		982		1598	
		Total time Lab		82		206		189		258		797
		Coeff. of increase Mach	1.0		2.5		2.3		6.0		9.7	
		Coeff. of increase Lab.		1.0		2.5		2.3		3.2		9.6
Stranding and Repairing	Average	Total time Mach.	233		410		377		982		1598	
		Total time Lab.		131		432		393		545		1050
		Coeff. of increase Mach.	1.0		1.8		1.6		4.2		6.9	
		Coeff. of increase Lab.		1.0		3.3		3.0		4.1		8.0

Table I

tion of the machine.

★ ★ ★

Fig. 4 represents the latest model of the machine, in which the pre-haulage capstan has been incorporated and is not visible.

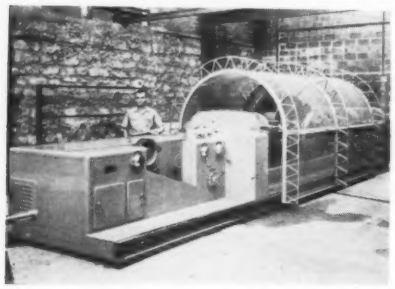

Figure 4.

When the machine is equipped with a double supply stand, the change-over of the pay-off drums can be done while the machine is running.

Economical Advantages of the New Machine

To make it possible to compare the different methods from an economic point of view and to demonstrate the advantage of the new machine, the time machine and labour has been calculated for the stranding of 10 km of cable of two different current sections 3 x 1 mm² (0.00155 sq.in.) and 3 x 10 mm² (0.0155 sq.in.), counting all auxiliary operations rerunning, tests and repairing, changing of drums and so on, for the new machine and for two typical machines with cage and two tubular machines. One fault per 3 km of core has been counted.

★ ★ ★

Table I shows the figures that have been found. Below, the total time can be read for machine and labour separately, and also a coefficient of increase that indicates the number of machines necessary to do the same work. Being 1.0 for the new machine, it varies between 1.6 and 6.9 for the others, when the cores are tested and repaired and wound on other drums. For the stranding alone, counting neither repairing nor rerunning of drums, this coefficient varies between 2.3 and 9.7.

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In Fig 1 the two stocks necessary between the preceding machine, the coilers and the stranding machine, are represented symbolically by the minimum of 3 drums (3 colours). In reality there are always many more drums in stock. With the new machine a second stock is avoided. The gain of space is therefore considerable.

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If one will compare the new machine with others, not mentioned in the comparative table, the same calculation has to be done for it.

★ ★ ★

In Table II is given the number of km that can be produced in 16 hours and per year on each type of machine with the percentage with regard to the new strander. It is 57% only in the most favorable case and drops to 10%.

★ ★ ★

Table III shows the cost of labour and the amortization (in 5 years) for the capital invested, per km cable manufactured on the different types of machines. The figures are calculated, based on prices and wages in France. The latter being higher in the U.S.A., the comparison would be more favorable in this country.

Conclusion

It can be concluded, that the cost of stranding per km on the new machine, tests and repairing included, is only one half with regard of the most favorable case of existing machines (tubular 1), and still less, if the stranding is compared separately.

★ ★ ★

The replacement of classic machines by those of the new type pays therefore, since the new machine would be amortized in about 2 years by the difference of cost of stranding alone, if operated at capacity.

TABLE II - OUTPUT IN Km. OF STRANDING MACHINE PER DAY 16 h. (per year)

FOR AVERAGE SECTIONS.

	New	%	Tubular I	%	Tubular 2	%	With cage Vertical	%	With cage Horizontal	%
With repairing (per year)..	41,2 (12.300)	100	23,4 (7.000)	56,6	25,4 (7.600)	61,4	9,8 (2.940)	23,8	6,0 (1.800)	14,6
Without Repairing..... (per year)	58,6 (17.600)	100	40,0		43,3		16,7		10,2	

III- CALCULATION OF COST OF LABOUR AND AMORTISATION PER Km. CABLE

Cost of labour : 320 fr/h. = 5,3 Fr/minute

Type of stranding machine	Value approx. francs french	Interest and amort.(5 years)	km/year	Amort/km	without repairing Lab. Fr/km	without repairing Total	without repairing Coeff	with repairing Lab. Fr/km	with repairing Total	with repairing Coeff
NEW Without Repairing.....	13.000.000	3.260.000	17.600	185	44	229	1,0	-	-	-
With repairing			12.300	264	-	-	-	69	[illegible]	1,9
Tubular 1	9.000.000	2.250.000	7.000	321	109	430	1,9	229	550	1,7
" 2 "	10.000.000	2.500.000	7.600	329	100	429	1,9	208	637	1,9
with cage vert.	1.300.000	325.000	2.940	1110	137	1247	5,5	289	1399	4,2
" " horizont.	6.200.000	1.560.000	1.800	8650	423	9073	40,0	556	9200	27,6

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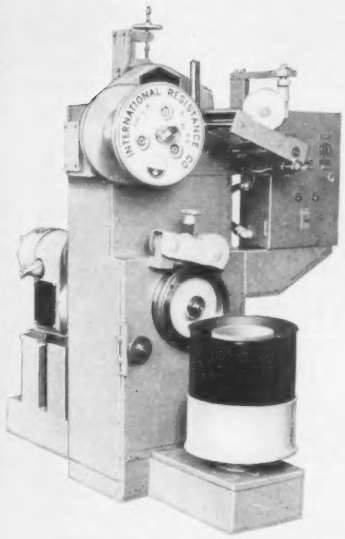
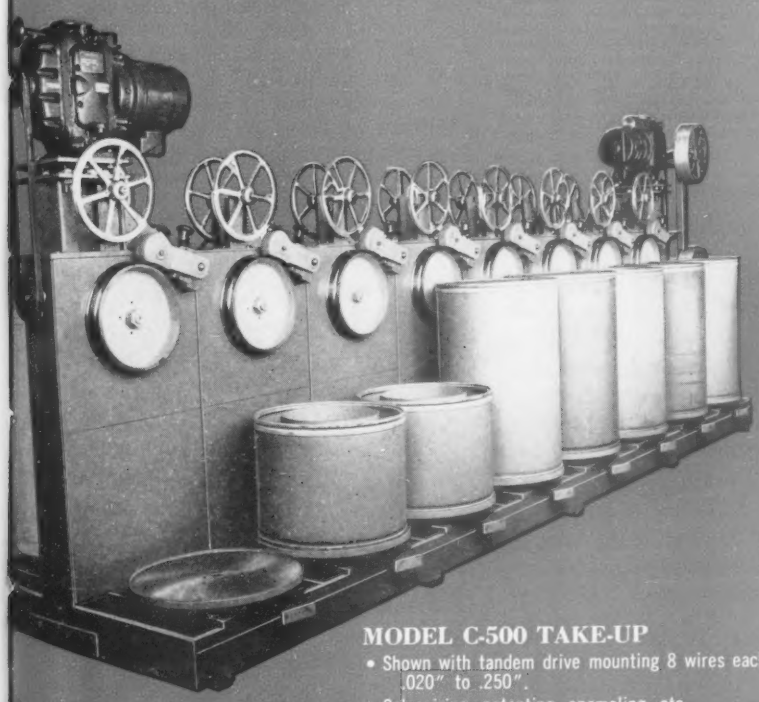
FOR CONTINUOUS WIRE PACKING & DRAWING



- Combination drum or spool take-up and rewinder.
- Shown for single wire.
- Adjustable for tension, pitch and amplitude of traverse.
- 12" spool shown. 30 to 150 lb. drums.

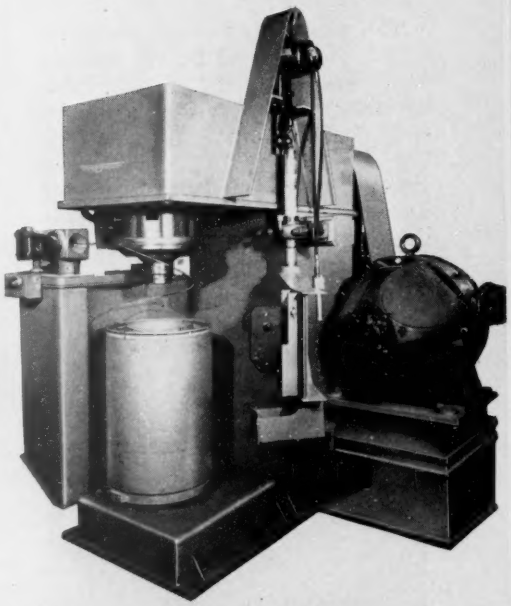
MODEL C-100 TAKE-UP

- Shown with single drive mounting to 16 wires .008" to .051"
- Enameling, annealing, galvanizing, tinning, etc.
- Containers 30 to 150 lbs.



MODEL C-500 TAKE-UP

- Shown with tandem drive mounting 8 wires each side .020" to .250".
- Galvanizing, patenting, enameling, etc.
- Drum or adapter weights 200 to 1,000 lbs.



MODEL 138-A DRAW BLOCK

- Single draft wires .016" to .375"
- "Draw-cast" die box shown gives adjustable positive cast control. Also available in other sizes.
- Process adapters to order — drums to 1,000 lbs.

r inquiry specifying the application which is of interest you will result in prompt and courteous attention.

Pat. No. 2,732,060. Other U. S. and foreign patents pending.

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Elevated Temperature Drawing of Steel Bars—A New Process

This article describes a development by which more uniform and better physical properties are made possible, the process being one developed by the La Salle Steel Company of Hammond, Indiana.

A new process for the production of materials with a unique combination of physical and mechanical properties was recently announced. This process has been named "e.t.d." (Elevated Temperature Drawing). The properties depend upon: first, careful selection of a particular material composition of steel; second, the control of the amount of deformation by reduction; third, the temperature at which deformation is carried out to bring about metallurgical changes which result in a new combination of physical and mechanical properties not heretofore available. This procedure has been developed to create a new combination of properties. It is not designed to facilitate the deformation process.

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The process is a development on which four United States patents were granted October 23, 1956, covering this invention (Patent Nos. 2, 767, 835; 2, 767, 836; 2, 767, 837 and 2, 767, 838). Other United States and foreign patents and patent applications also describe this process.

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Fig. 2—Uniformity of new "Fatigue-Proof" steel bar is demonstrated on hardness tester with Brinell indentation magnified 70 times. * * *

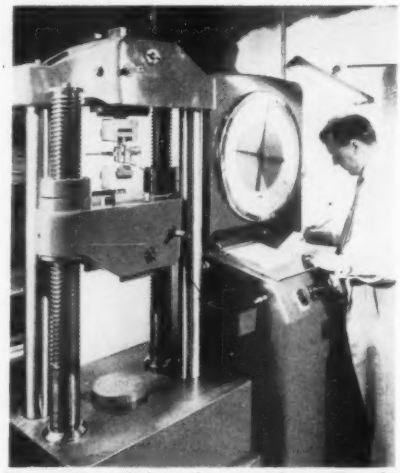

Fig. 1—Controlled testing procedures like the standard tensile test above are used to assure the "Fatigue-Proof" strength levels, as produced by the "e.t.d." process. Production tests taken on the basis of the first year's production have shown that 73% of all orders processed had tensile strengths of over 150,000 p.s.i. While the company guarantees 140,000 p.s.i., its aim still is 150,000 p.s.i., and this strength level is generally met. * * * * * * * *

For the first time in steel bar products, the dimensional tolerances, surface finish and excellent machinability generally associated with cold finished bars have been incorporated into a bar product which also has strength properties normally developed by heat treatment. (Heat treatment here is meant to describe the standard quench and temper cycle for hardening steel.) Further, it eliminates the need for heat treating and attendant operations in many instances for consumers.

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Elevated Temperature Drawing involves the selection of bar chemistry, the amount of reduction in cross sectional area of the bar as it is drawn through a die and a drawing temperature which will result in the desired final properties.

★ ★ ★

These properties occur as a result of three metallurgical phenomena which take place in the bar as it is deformed at elevated temperatures of between 200°F. and below the lower critical temperature.

★ ★ ★

First the steel bar strain hardens by appropriate slip processes within the crystal structure. Secondly, it age hardens by precipitation of nitrides along with precipitation of carbon from supersaturated solid solutions. Thirdly, a substructure within the grains develops as a result of the deformation at elevated temperatures.

★ ★ ★

Proper control of these metallurgical processes results in the unique combination of properties which can be produced by "e.t.d.".

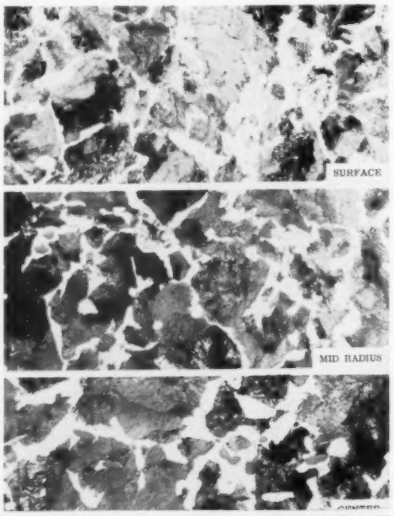

Fig. 3—Photo micrograph of "Fatigue-Proof" structure. Shows a uniform pearlitic structure. Retained austenite and untempered martensite cannot be present. This remarkable uniformity is a result of manufacture by the new "e.t.d." process. * * * * * * * *

Background

To help in placing this development in perspective, it may be helpful to review the major technical developments in the cold finishing industry during the past 50 years.

★ ★ ★

Initially, steel bar stock was furnished in the hot rolled condition. Gradually the demand for better tolerances, finer finish and accelerated machinability led to the development of cold rolled bar stock. This method of cold finishing was, however, soon superseded by cold drawing. The cold drawing process was more efficient and provided higher quality in terms of tolerance and finish. This method of cold finishing is the present production method.

★ ★ ★

Approximately 20 years ago there began to develop generally a better appreciation of the importance of the physical as well as mechanical properties of barstock. This led to the development of stress relieving of barstock after cold drawing to lower the stresses in the bar and to raise the yield strength over material cold drawn alone.

★ ★ ★

About 15 years ago a patented process (Patent Nos. 2, 320, 040 and 2, 589, 881) for taking abnormally heavy reductions followed by stress relieving was introduced by La Salle as the next step in satisfying the demands of materials users for improved properties.

★ ★ ★

After World War II the company embarked on an expanded research and development program. One of the major objectives of this program was the development of new and improved materials with better properties, improved service characteristics and lower costs for finished parts. Its efforts have led to the development of the new process "e.t.d."

Materials problems grow continuously more acute as demands for intricate design, higher operating speeds and temperatures and better part life become more critical. There are three basic problems which enter into the long range material requirements for our country's economy:

(1) Alloying elements such as nickle and chromium along with many others are scarce and may become scarcer with time.

These elements, which form an essential part of alloy steels, must be conserved in every way possible. They must be restricted to those applications where the requirements for properties are such that no alternative process applied to less scarce materials may be successfully employed. The alloying elements are used in general for two purposes, (a) to promote corrosion resistance and (b) make possible those properties which can be achieved by appropriate heat treating cycles.

(2) In times of emergency there has always been a shortage of heat treating capacity, furthermore, as the demands for better uniformity and higher quality grow more insistent the heat treating process will be carried out under highly mechanized conditions requiring intricate equipment and skilled operators.

(3) Finally suppliers of materials are becoming increasingly aware of the problems of producing components from semifinished materials in the form of bars or shapes. As material specifications become more critical and strength and hardness requirements rise, the machining characteristics tend to go in the opposite direction. The forming of parts by machining or cold forming procedures, the joining of materials by techniques which may alter the properties of those materials, are all problems which the material supplier is becoming more conversant with and which must be solved.

Commercial Application of Process

On September 6, 1955, "Fatigue-Proof," a new material embodying a new combination of properties made by the new process, "e.t.d.", was first made available commercially.

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The product made from a carbon steel was designed and meets specifications set up to answer, at least to some degree, the three basic materials problems discussed.

For the first time a steel bar product can be produced commercially having a guaranteed Rockwell C values of 30, a tensile strength of 140,000 p.s.i. and a yield strength of 125,000 p.s.i. In addition, the material has remarkable free machining characteristics. It machines about 25% faster than annealed alloy steel and as much as 100% faster than alloy steel heat treated to the same strength level.

★ ★ ★

Inherent in the manufacturing procedure is a uniformity of property from heat to heat, bar to bar and across the diameter of the bar which has heretofore not been available in quenched and tempered bar stock.

★ ★ ★

The product was named "Fatigue-Proof" to bring to the attention of designers and other interested materials users its improved life in service. Actual fatigue tests support this fact.

★ ★ ★

This first new product of the Elevated Temperature Drawing process, it is felt, illustrates the versatility of the process.

★ ★ ★

To summarize:

The "e.t.d." process holds promise of bringing about the following:

1. **The lessening of the dependence on strategically scarce alloys.**
2. **The making possible of combinations of properties not economically attainable by present methods.**
3. **In many cases the elimination of heat treatment and subsequent operations.**
4. **The combination of high strength with improved machinability.**
5. **The direct production by machining operations only of parts that have heretofore required multiple and often costly operations.**

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Metallographic Study of Hot Dipped Zinc Coatings

by

A. T. Baldwin and W. H. McMullen

Hanson-Van Winkle-Munning Co.

Matawan, N. J.

The hot galvanizing methods used with many products today give coatings that are ductile and adherent. Sheet and strip can be formed under severe conditions, wire can be drawn to smaller diameters and the coatings on castings, forgings, stampings and the like are more adherent. Some of these results follow from radical changes in the process, such as the use of high aluminum (0.10% to 0.20%) containing zinc baths in galvanizing strip steel. Others are the result of better understanding of the factors which influence the results obtained from the use of the conventional baths.

★ ★ ★

These improvements in the performance of the hot galvanized coatings would seem to be associated with the coating structure. Our studies as reported herein were made to detect and record structural differences to be used as a possible guide to continued improvement in these very desirable characteristics of a hot applied zinc coating on ferrous objects.

This article is based on a paper prepared by the authors for a meeting of the American Zinc Institute, which has authorized the use of the material presented there in this article. It describes processes that increase the ductility and adherence of the coatings.

Microscopic examination of the structures obtained in various ways in daily use are presented here photographically. An effort has been made to add other views of the structures to the familiar ones which record what is seen in a transverse section of the coating. We have taken longitudinal and tapered sectional views. Of these the tapered section CC[1] in Fig. A taken at about 5° taper discloses the newest information on structural condition.

★ ★ ★

It has been concluded by researchers that the zinc coating is composed of an outer cast structure, referred to as Eta, having the same composition as the molten zinc. The zinc-iron alloy adjoining the Eta phase is called Zeta with the formula $FeZn_{13}$ and is a monoclinic crystal frequently called the palisade layer. The next zinc-iron alloy usually seen below the Zeta and at the iron interface is called Delta with the formula $FeZn_7$ and is a bipyramidal hexagonal crystal. Other alloy crystals such as Gamma, Fe_3Zn_{10} shown on a zinc-iron equilibrium diagram do not usually show in photomicrographs of current produced coatings because the immersion time is too short. At very long times of immersion, a thin band of this Gamma alloy appears between the Delta phase and the steel itself.

★ ★ ★

The character of the coating on commercially galvanized wire by the charcoal wiping process is shown in Fig. 1, 2 and 3 in three views in each case. Galvannealed wire is shown in Fig. 4. Low and high carbon steel coatings are shown in Figs. 1 and 2, where the major difference between the two coatings shows up in the taper sections. Note the lined structure of the Delta phase in Fig. 2 not appearing in the Delta phase of the low carbon wire. We believe these

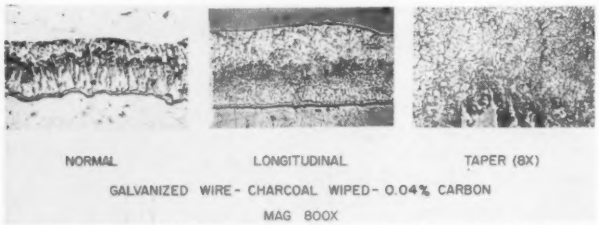


Figure 1.

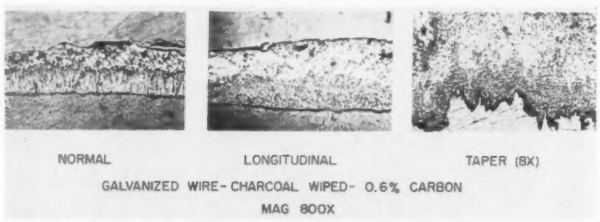


Figure 2.

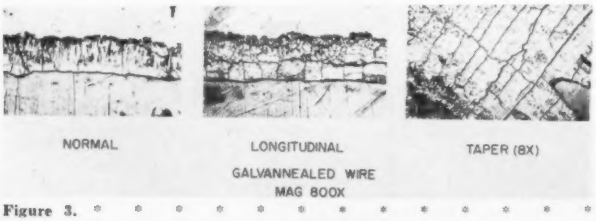


Figure 3.

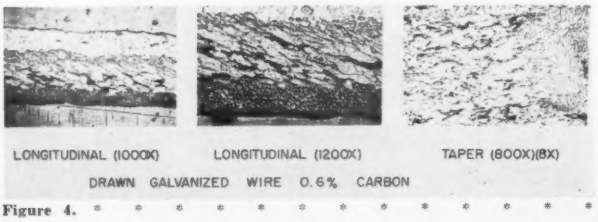


Figure 4.

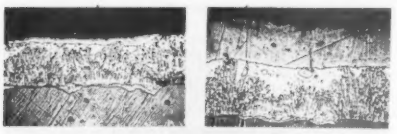
dark lines indicate grain boundaries and are not evidence of structural weaknesses. This is disclosed also in Fig. 3 where the longitudinal section shows flowing of these alloy layers as a result of reduction in area with drawing. The taper section shows the laying over of the Zeta crystals and further evidence of the adherence to the ferrous base.

★ ★ ★

The galvannealed wire (Fig. 4) shows a prominent Delta layer in the normal section and the lines in the longitudinal section which, in this case, result from the annealing. In the taper section the structure shows the effect of this annealing on the Delta layer appearing normally as seen in Fig. 1 and 2. This equi-axial structure of the Delta layer originates as lines at the ferrous interface in all cases coming under our observation.

★ ★ ★

For comparison of modern coatings on strip steel with that which is characteristic of past general practice, we are including Fig. 5 which shows the coating structure obtained on sheet steel galvanized in a bath with little or no aluminum present. At the bottom of each picture is the ferrous base and immediately above that is a thin, irregularly wide layer of the Delta phase. Then follows the needle-like Zeta layer and lastly the purer zinc, or Eta layer.



GALVANIZED SHEET – RIMMED CULVERT STOCK.
FE 1164 MG/FT2
MAG 800X

Figure 5.

Attention is drawn to the distribution of the Delta and Zeta layers, in that there are many more Zeta crystals in those regions of least thickness of the Delta layer. This relationship appears frequently with galvanized coatings and is important since the needle-like Zeta crystals are readily detached when the coating is disturbed. This situation might possibly lead to the production of more dross.

★ ★ ★

The modern, high speed continuous hot galvanizing of strip steel is carried out in zinc baths containing from 0.10% to 0.20% aluminum, the so-called high aluminum baths. This is done because the presence of the aluminum inhibits the attack of the zinc on the strip, thus limiting the iron in solution in the zinc to appear as crystals in the coid coating. As a result the very homogeneous coatings (Fig. 6) are obtained which in some cases seem to be free of any of the phase crystals encountered by old methods as shown in Fig. 5.

★ ★ ★

Typical views of these coatings which show in what way the amount of iron in the coating appears as some sort of crystal are given in Fig. 6. Note especially the very homogeneous coating where only 29 milligrams of iron per sq. ft. of the coating are present. Crystals are present as will be seen in the tapered view of this same coating in Fig. 7.

★ ★ ★

The taper section views of these three coatings disclose phase crystal formations which are typical of the zinc-iron binary alloys. This is clearly seen with the 198 milligrams of iron per sq. ft. view where the lined Delta formation exists. If crystals which include aluminum in their structure are present, they must be very minute. We have not been able to determine any consistent relationship analytically between the iron and aluminum contents of the coating. Each manufacturer, rather, appears to create coatings having an aluminum content which reflects his use of metal in his zinc bath. The coatings recorded in Figs. 6 and 7 are from product secured from more than one producer.

Table #1 - Iron and Aluminum in Coating

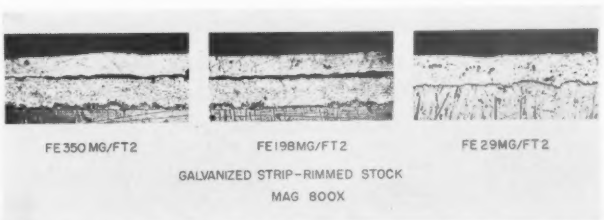
(in Fig. 6 & 7)

	Fe Mg/ft^2	Al Mg/ft^2
Left view	29	26
Center "	198	20
Right "	350	50

As yet the data just given in the amount of iron in the coating is not in a range which gives a measure of the ductility or adherence, or the ability of the coating to stand severe forming operations. Those cases illustrated do stand severe forming operations.

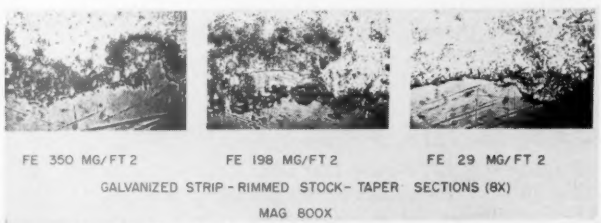
★ ★ ★

Modern hot galvanizing practice is proceeding in two ways to control the amount of iron dissolved by the fluid zinc in actual operation. With the wire the method of control is to limit the time of exposure of the ferrous base to the zinc without the aid of aluminum. The use of aluminum inhibitor is greatest in the U. S. A. on continuous strip. Possibly these two approaches will be expanded in use depending largely on the ease of application to the work to be zinc coated.



FE 350 MG/FT2 FE 198MG/FT2 FE 29MG/FT2
GALVANIZED STRIP-RIMMED STOCK
MAG 800X

Figure 6.



FE 350 MG/FT 2 FE 198 MG/FT 2 FE 29 MG/FT 2
GALVANIZED STRIP - RIMMED STOCK - TAPER SECTIONS (8X)
MAG 800X

Figure 7.

Industry Leaders Address Annual Spring Meeting of NEMA'S Wire and Cable Section

Members of the Wire and Cable Section of the **National Electrical Manufacturers Association** concluded their annual 2-day spring convention at Rye, N. Y., on April 11th with a series of discussions, reports and talks covering a wide range of topics, including atomic power, market potentials and engineering matters of interest to the wire and cable industry. The convention was attended by more than 100 leading manufacturers of wire and cable products.

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Highlights of comments made by some of the speakers follow:

Silicone Rubber

Robert Lyle, National Electric Products Corp. said: "In the last three years, the technology of silicone rubber has progressed to the point where it can compete as a general insulation. Heretofore, silicone rubber has been largely limited to high temperature applications where thermal stability was more important than electrical properties. The newer silicone rubbers, however, are excellent in their electrical properties, competitive with conventional rubber in their physical properties, and retain their superior heat resistance.

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"**The** improvement in physical properties has opened up the field of high voltage insulation to silicones. The principal deterrent to their acceptance in general application is their high cost.

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"**There** is little likelihood of a reduction in price within the foreseeable future, so that we can expect growth only in the specialized fields where cost is less important than service. The greatest opportunity probably lies in the field of high voltage insulation and power cable applications."

A digest of the papers and talks given at this meeting. More complete information on subjects of interest to our readers may be secured through NEMA at 155 East 42nd St., New York 17.

Higher Building Voltage

Lawrence W. Hornfeck, Consulting Engineer, in discussing the subject, Higher Voltages in Commercial Buildings, said: "Many factors have tended to cause a recent trend toward the use of higher voltages for the transmission of electrical energy."

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Included among such "causes", he said, are increased usage of electrical energy, architectural developments, rising construction costs and the necessity for electrical rehabilitation of existing buildings.

Looking Into the Future

W. T. Stuart, Editor, Electrical Construction and Maintenance, and **C. B. Shaw,** Manager and Research Director, Electrical Construction and Maintenance and Electrical Wholesaling, stated that the market for wire and cable products will double in ten years, impelled by advancing utilization and new technical requirements. Increasing complexity and dependability requirements of electrical systems will offer broad opportunities for high quality specialties.

★ ★ ★

The overall market total for all electrical and associated products presented by the electrical construction and installation fields is over $4 billion dollars in 1957 and still growing. The growth is significantly accelerated by advancing standards of utilization in lighting and power applications, and by a phenomenal increase in air conditioning.

★ ★ ★

Advancing utilization is not only increasing the electrical component of new construction, but is requiring replacement and modernization of electrical systems in existing buildings. The need in this category is so acute that the market potential could exceed the capabilities of the skilled manpower available for the task.

Grounding Problems

L. S. Inskip, Protection Engineer, Bell Telephone Laboratories, referring to the subject of his address, "To Ground Or Not to Ground," prefaced his remarks with these statements: "As the title of the talk implies, the grounding of electric circuits and equipment is somewhat controversial and in many segments of the industry the principles of grounding are not well understood. The title further implies that there may be conditions where grounding may not be as desirable for safety as relying upon adequate insulation, particularly in appliances."

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Having given his audience this background, the speaker continued: "Circuits are grounded for the purpose of limiting the voltage upon the circuit which might otherwise occur through exposure to lightning or other voltages higher than that for which the circuit is designed, or to limit the maximum potential to ground due to normal voltage. Metal conduit, the armor of armored cable, and exposed metal of equipment are grounded to prevent a potential above ground on the exposed metal. For effective grounding the path to ground from circuits, conductor enclosures or equipment should be permanent and have ample carrying capacity to conduct safely any currents liable to be imposed on it and should also have impedance sufficiently low to limit the potential above ground and to facilitate the operation of over-

current devices in the circuit.

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"The National Electrical Code is quite specific as to what, when and how to ground. Slides will be shown to illustrate the effects of improper grounding or of wiring irregularities on safety, particularly as applied to portable equipment and appliances in the home and in industry."

Green Ground Conductor Problems

S. J. Rosch, Consulting Cable Engineer, Anaconda Wire and Cable Co., in discussing the problem of the green ground conductor, called attention to a reference in the 1956 edition of the National Electrical Code, identified as 94003, which states:

★ ★ ★

"A conductor intended to be used as a grounding conductor shall have a continuous identifying marker readily distinguishing it from the other conductor or conductors. The identifying marker shall consist of one of the following:

"a. Colored Braid. A braid finished to show a green color.

"b. Colored Insulation or Covering. For cords having no braids on the individual conductors a green insulation or a green covering on one conductor."

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Also, he said, "there is a footnote to this section of the Code which reads as follows: "Until January 1, 1958, this shall not be construed as prohibiting the use of a conductor having a green finish as an ungrounded circuit conductor in cords having no conductor used as a grounding conductor, provided the green conductor is reidentified at the terminal ends."

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The effect of the foregoing, Mr. Rosch stated, "is that the flexible cord industry will have to carry two sets of stocks of flexible cords. One stock will have to include a green conductor if the usage of the particular cord requires that the appliance or equipment to which it is connected must have an equipment ground. The second type of cord will be one which contains no green conductor since the use of that type of cord means that all of the conductors are of the ungrounded type.

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"**In** the past, where such cords contained a green conductor and there was no necessity for an equipment ground, the green conductor could be used as an ungrounded conductor by merely painting the green conductor at the terminals with some other color. Permission to do this is contained in the footnote regarding the January 1, 1958 deadline. On and after January 1, 1958, such permission to paint the terminating portions of the green conductor with another color, will no longer be allowed and if a cord is available that does contain the green conductor but the equipment does not have to be grounded, that green conductor will simply be wasted because it will not be permitted to serve in the same capacity as the other conductors in the cord, finished with a color other than green.

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"**This** introduces complications in that no one in the cable industry really knows where the flexible cords are used. The same is usually true of distributors of such cords. People simply come in and ask for a given type of flexible cord, the same as they did in the past."

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L. D. Price, Manager, NEMA Engineering Department, discussed safety regulations problems relating particularly to wire and cable products as he observed them during his recent trip to England, France, Belgium, Holland, West Germany, Switzerland and Italy. He also spoke of the standards used, and the activities and facilities of approvals laboratories in those countries. In addition, Mr. Price discussed such immediate problems as the identification of grounding conductors, grounding of electrical equipment, use of plastic conduit and the standardization of utilization voltages.

Other Key Speakers

Other speakers included **Carroll Baddeau,** Chief Engineer, Thomas and Betts Co.; **R. C. Graham,** Rome Cable Corp.; **J. A. Szilard,** Assistant Director Research, General Cable Corp.; **Joseph J. Kovaleski,** Draw-Pak Sales and Application Manager, The Coulter and McKenzie Machine Co.; **W. I. Newstetter, Jr.,** Executive Vice President, Lease Motor Vehicle Co., **George Edgar Dean,** Distribution Engineer, Public Service Gas and Electric Co., and **David Molthrop,** Toledo O., Industrial Relations Consultant.

★ ★ ★

Mr. Badeau's talk was concerned with developments in wire and cable connections and included references to advantages of copper and aluminum as conductor material; latest designs in wire connections, conductor insulation and how building wire can be used to better advantage.

★ ★ ★

Mr. Graham discussed recent and anticipated applications of new insulations for power cables, including thermoplastics, such as polyethylenes or poly-olefins, as well as the elastomers such as butyl, silicone rubber and hypalon. He reviewed the major advantages and disadvantages of these materials and commented on their future status as power cable insulation. Mr. Szilard discussed current magnet wires, including trade names, properties and end uses.

★ ★ ★

Mr. Kovaleski presented a film and commentary to the wire and cable manufacturers showing various types of containers used for packaging wire in pails and drums.

★ ★ ★

Suggestions for solving transportation problems of sales and service personnel were discussed by Mr. Newstetter. There are, he said, four ways of handling transportation: to provide a man with a company-owned vehicle, provide him with a leased vehicle, pay him mileage allowance on his personal car, or lease the car from him for business purposes. There are disadvantages to all of these transportation methods and the type suited for one company may not work out well for either the salesman or management of another company.

(*Please turn to page* 707)

Computing of Picks per Inch and Ends per Carrier for Braided Cable Shields

by C. K. Weihs
Project and Specifications Engineer
Tensolite Insulated Wire Company, Inc.
Tarrytown, New York

This article, with its accompanying graph, will be of practical value to the cable engineer, as it embodies formulae found useful in an electric wire and cable manufacturing plant.

The specifications for cables issued by government agencies and private organizations demand low shield braid angle (for easy push-back of the shield) and sufficient shield coverage.

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The formulas to determine these factors are relatively complicated and time-consuming. This study tries to simplify the formulas and work them into graphs which permit the finding of the data involved by easy slide rule calculations.

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It will be shown how far the core diameters influence the braid angle under the condition that the ends per carrier and the picks per inch are kept to practical values.

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The formula to determine the number of picks per inch P is:

$$(1)\quad P = \frac{\tan\alpha \times C}{2\pi(D+2d)}$$

α = braid angle
C = no. of carriers*
D = diam. under shield (core diameter)
d = diam. of braid-wire

We shall call

$$(1a)\quad \frac{\tan\alpha \times C}{2\pi} = C_p$$

picks-constant

and draw a graph (Fig. 1a) showing Cp in relation to the braid angle α. We simplify (1) to

$$(1b)\quad P = \frac{C_p}{D+2d}$$

and find accordingly the picks per inch by dividing the picks-constant Cp by (D + 2d). The minimum of ten picks per inch is recommended for good production results. The choice of a larger braid angle is necessary if the core diameter brings P below this number as Cp grows with the size of the braid angle.

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By reversing (1b) to

$$(1c)\quad C_p = P(D+2d)$$

the picks-constant of a braided shield can be computed and, with the help of the graph, the braid-angle found.

★ ★ ★

The formula for the one-way-coverage F of a braid is:

$$(2)\quad F = \frac{Nd}{\sin\alpha} \times P$$

whereby: N . . . number of wires (ends) per carrier.

★ ★ ★

The formula for the two-way-coverage—by using the same number of ends per carrier in both directions—is

$$(2a)\quad K = (2F - F^2) \times 100\%$$

The value of F for a desired two-way-coverage can be determined from the graph, Fig. 2, showing F in dependence of K.

★ ★ ★

By replacing P in (2) by (1b) the one-way-coverage reads:

$$F = \frac{Nd}{\sin\alpha} \times \frac{C_p}{D+2d}$$

* This number for the 16 carrier braider; change constants proportionally for different number of carriers.

We establish the constant C_F, the coverage-constant

$$(2b)\quad C_F = \frac{C_p}{\sin\alpha}$$

and show C_F in a graph, again in relation to the braid-angle (Fig. 1b). The formula (2) becomes now:

$$(2c)\quad F = Nd\,\frac{C_F}{D+2d}$$

★ ★ ★

By computing F for a given braided shield the two-way-coverage K can be found with graph, Fig. 2.

★ ★ ★

To find the number of ends per carrier (2c) is reversed:

$$N = \frac{F}{C_F} \times \frac{D+2d}{d} \quad \text{and}$$

$$(3)\quad C_N = \frac{F}{C_F}$$

is called "ends-constant".

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Now we draw graphs (Fig. 1c) showing C_N in relation to the braid angle for different values of F. The number of ends per carrier can be calculated from:

$$(3a)\quad N = \frac{D+2d}{d} \times C_N$$

★ ★ ★

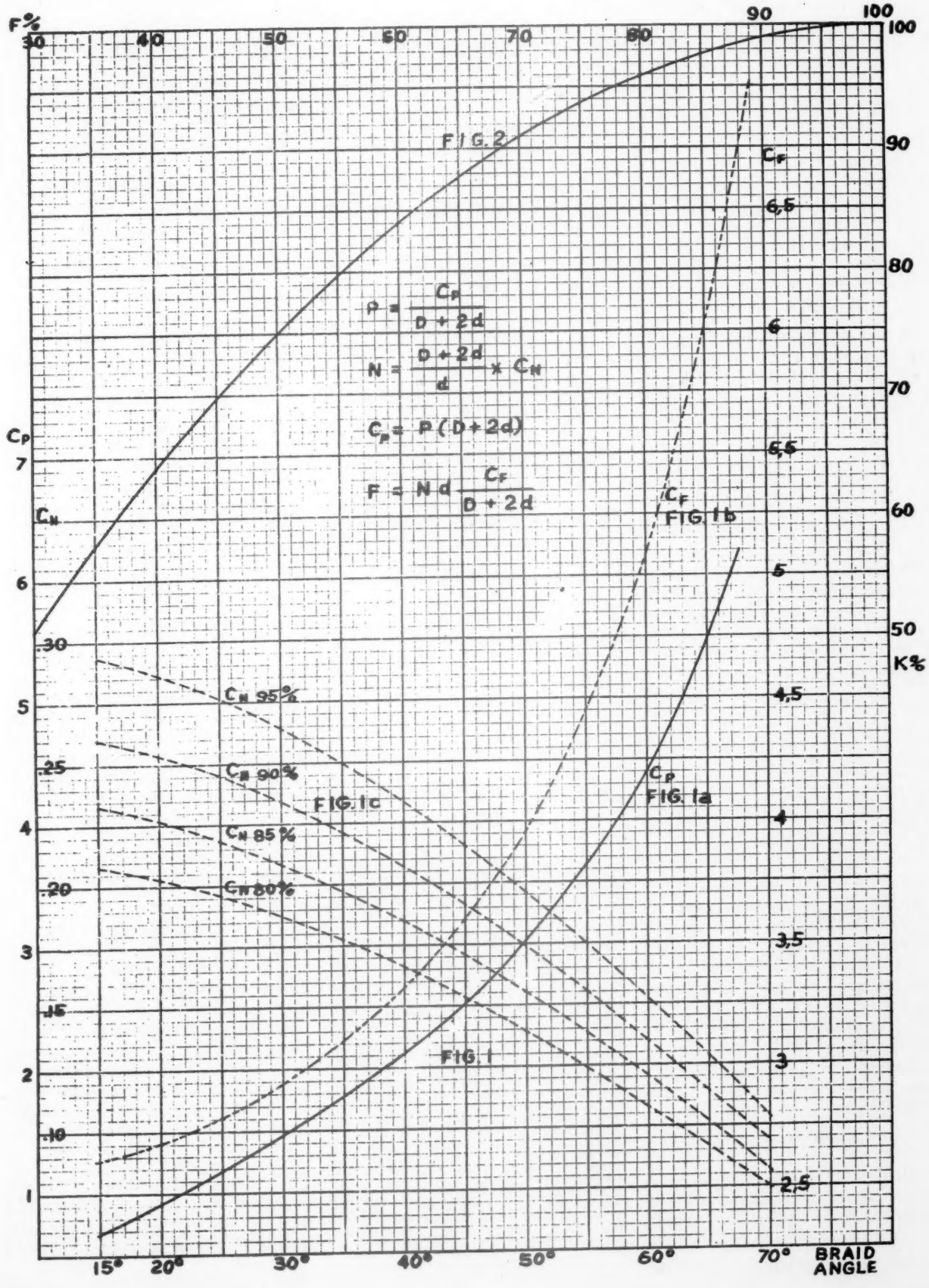
N must be a whole, not fractional number. For practical reasons it should not be larger than 8:

$$C_N\frac{D+2d}{d} + 1 > N \geqq C_N\frac{D+2d}{d}$$

★ ★ ★

(3a) shows that the number of ends will be larger with increased

(*Please turn to page* 712)


F%
30
40
50
60
70
80
90
100
FIG. 2
$P = \frac{C_P}{D + 2d}$
$N = \frac{D + 2d}{d} \times C_N$
$C_P = P(D + 2d)$
$F = N d \frac{C_F}{D + 2d}$
C_P
C_N
C_F
FIG. 1b
FIG. 1a
FIG. 1c
FIG. 1
C_N 95%
C_N 90%
C_N 85%
C_N 80%
7
6
.30
5
.25
4
.20
3
.15
2
.10
1
6,5
6
5,5
5
4,5
4
3,5
3
2,5
K%
50
60
70
80
90
100
15°
20°
30°
40°
50°
60°
70°
BRAID ANGLE

New Type of Upholstery Spring Units Developed on Coast

New developments are always of interest. This brief article describes a recently conceived process of putting upholstery springs together in long continuously made units that has reduced assembly costs and produced better seat cushioning.

Unlimited freedom of design for today's furniture manufacturers has been made possible by a Los Angeles concern.

* * *

The Marspring Corporation has accomplished this by creating methods and facilities for the mass production of unusual-shaped cushion units, formerly considered "custom" items. This Marspring development utilizes the softness of hundreds of tiny, individually pocketed steel springs.

* * *

The heart of the new development, patented "Marflex", is steel wire produced to rigid specifications at the Los Angeles steel plant of Bethlehem Pacific. In the Marspring plant, strands of 16 gauge spring wire unreel into forming machines that produce the coils and tuck each coil into individual pockets of cloth in unbroken lengths. This new idea in seat cushion spring units is manufactured economically and on a basis competitive to other cushioning materials.

* * *

The chain of pocketed coils is nested into cushion units of rubberized hair, the bottom and side panels of which have been preassembled. When the cavity is filled with a specified number of coils, an operator snips off the length, bonds the top covering of rubberized hair and the cushion unit is ready for shipment to the manufacturer.

* * *

All this in a matter of seconds, regardless of the shape of cushion being made.

* * *

"It's really simplicity itself", declared **Lloyd Thompson,** co-owner of Marspring, "and for the life of me, I can't see why we didn't think of it years ago". But, they did think of it, he and his partner, **Sidney Klein.** The two of them introduced the new product to the trade about this time last year.

* * *

The rising clamor on the part of the buying customer for upholstered household furniture featuring softer seating, yet styled along contemporary lines, also played an important part in the development.

* * *

Furniture in the home of today is more functional; it is put to much greater use than the furniture of a few generations ago. Few are the homes with rooms that are used only on special occasions, and therefore furniture pieces now must have the ability to stand up under more rigorous and continuous wear than formerly.

Individually pocketed springs, formed in long continuous lengths, being nested into rubberized hair seat sections to provide support for cushions of any shape, standard or special, by process developed by Marspring Corporation.

* * *

In this respect, the Marspring people feel that spring steel coils, as they use them in Marflex preformed cushions, gives the homeowner maximum luxury in seating comfort. An increase of upwards of 40% more steel springs is used in Marflex cushioning as compared to conventional types, providing more uniform support and wearability. Five densities of cushioning give both the manufacturer and buyer a wide latitude in furniture designs.

* * *

Marflex springs took two years to develop after the original concept. Special machinery and equipment had to be designed and made. Close coordination was achieved with Bethlehem Pacific steel metallurgists to assure delivery of the right grades and sizes of spring wire from the nearby steel plant, as spring quality is all-important.

* * *

The result has been a new type of seat cushion unit for upholstered furniture that can be made with little hand labor to conform to all the curves of unusual shaped seats. Because of the increased use of hundreds of small springs, cushions of varying thicknesses are available that represent a milestone of progress in furniture construction.

Read WIRE AND WIRE PRODUCTS regularly. Domestic subscription price: $8.00 per year.

The Wire Association Awards for 1956

The Association's Medal Award Committee presented through its Chairman, **David M. Schmid,** President of Techalloy Co., Inc., its 1956 award selections to the Board of Directors at the regular semi-annual meeting of the Board at Hamilton, Ontario, on May 13, 1957. The selections were unanimously approved and the awards will be made at the Annual Convention of the Association in Chicago in October. Awards are made each year.

★ ★ ★

The winner of the Medal Award for the most meritorious paper in the Ferrous Division was **George A. Sweitzer, Jr.,** Metallurgical Investigator at the **Jones and Laughlin Steel Corporation's** Aliquippa Works. His paper was entitled "Electromatic Oil Tempered Wire."

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Runner-up for the honor in the Ferrous Division was **N. Dale Montgomery,** Metallurgist, Rod and Wire Division, **Pittsburgh Steel Company,** Monessen, Pa. Mr. Montgomery will be awarded a Certificate of Honorable Mention for his paper, "Control Measures for the Heat Treatment of High Carbon Rods and Wire." This paper was presented at the last Annual Convention.

★ ★ ★

In the Non-Ferrous Division, the Committee selected for the Medal Award the paper "Hot Dip Wire Aluminizing Processes and Alloys", which was written by **J. D. Sprowl,** Department of Metallurgical Research, **Kaiser Aluminum and Chemical Corp.,** Spokane, Wash., and delivered by him at the Annual Convention last fall.

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A second Non-Ferrous Division paper by **Benjamin H. Davis,** Vice President, **The Standard Machinery Company** (now The Davis-Standard Division of Franklin Research Corp.), Mystic, Conn., received a certificate of Honorable Mention. Mr. Davis' article was published in the March, 1956, issue of Wire and Wire Products.

David M. Schmid
Chairman, Medal Awards Committee

The Board of Directors presents each year Medal Awards and Certificates of Honorable Mention to those authors of technical papers and articles given at Association meetings or published in Wire and Wire Products as a donation to The Wire Association which, in their opinion, represent the most meritorious contributions made to the advancement of the wire industry's interests, productionwise.

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Papers eligible for awards are judged by the Oxford System, which is considered the best one so far devised for the impersonal determination of the worthwhileness of papers. Consideration is given to the following points, among others:

1. **Value of the paper to the Wire Association's members as a whole.**
2. **Does it contain new information that has not been published hitherto, or is it merely a restatement of research material?**
3. **Does it constitute an advancement in knowledge by clarification of past information?**
4. **Does it provide a re-assessment of known facts in such manner as to be readily understood by the industry as a whole?**
5. **Are the claims in the paper factually supported with definite, impartial test data and established experience?**
6. **Is the paper valuable as a reference work?**

★ ★ ★

Of all the many articles and papers published in **Wire and Wire Products,** only a relatively few are eligible for judging by the Committee.

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The first consideration of eligibility is that the author or authors must be Association members. A second is that it must be a contribution to the Association or to Wire and Wire Products, as articles for which the magazine has paid an honorarium cannot be included. A third is that any paper that has been previously presented before another society or published in another magazine cannot be taken under advisement.

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In view of the many excellent articles and papers carried by **Wire and Wire Products** that were written by persons who were not members of the Association, the Committee recommended that in all such cases the Association write to the authors calling attention to the situation and inviting them to become members. In those instances where papers are submitted by members for a financial consideration, the Committee believes that authors should be advised of the terms of eligibility for awards.

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The Medal Award Committee expressed the opinion that the quality of papers now being published in **Wire and Wire Products** has been improving steadily and that continued efforts should be made to keep the editorial standards curve moving upward. It was felt that a knowledge on the part of authors that their papers would be considered would be an inducement to increased efforts to attain the coveted awards.

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(*Please turn to page* 705)

Government Wire Production Information

What Records to Retain

The latest information on what records the public should maintain and hold against possible Government audit or examination will become available with the publication by the General Service Administration of its 1957 edition of "Guide to Record Retention Requirements".

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The new Guide, revised to January 1, 1957, appeared in April as a special supplement of the **Federal Register** that GSA publishes daily as a digest of current notices and regulations issued by Federal agencies.

★ ★ ★

The 56-page document, separately bound this year for the first time, contains 887 entries detailing the responsibility and retention period for the many types of records that can be required by 10 Executive Departments and 16 independent agencies of Government. Each entry includes a brief description of the type of records to be kept by an activity affected by Government regulation, who must keep them and, in most instances, how long they must be retained. Periods of retention vary from 6 months to 60 years with 3 years appearing as the most common requirement. No retention period is indicated for about one-third of the items listed.

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Although most of the entries relate to actual regulations some few are of an advisory nature only. The Guide itself carries no regulatory force but is designed as a public service. Its primary purpose is to inform private interests of their record-keeping obligations and to simplify the task of fulfilling them.

Copies of Part II of the Federal Register, containing the Guide, may be purchased from the Superintendent of Documents, Government Printing Office, for 15 cents.

New ASTM Tentatives

Tentative Specifications for Silicone Varnished Glass Cloth and Tape (D 1459 - 57 T) (Approved Jan. 31, 1957)

These materials, used at higher temperatures than most organic coated materials widely used in the electrical industry, are important commercial insulating materials for which uniform industry standards are needed. These Committee D-9 specifications cover material in the form of sheets, rolls, and tapes in two types for two uses: type A, where maximum electrical properties are required

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and type B, for maximum physical properties.

★ ★ ★

Tentative Methods of Testing Fully Cured Silicone Rubber Coated Glass Fabric and Tapes Used for Electrical Insulation (D 1458 - 57 T) (Approved Jan. 31, 1957)

These methods cover sampling, conditioning, thickness, breaking strength, breaking strength after creasing, dielectric breakdown, dissipation factor and dielectric constant, volume resistance, weight, and threads per inch.

★ ★ ★

Tentative Methods of Test for Electrical Resistance of Insulating Materials (D 257 - 54T) (Approved Jan. 31, 1957)

This widely used method, a basic one in insulating materials, has been thoroughly revised to clarify and improve the procedure. An innovation is the use of the term "picofarad" which is synonymous with the familiar "micromicrofarad."

N.E.W. Results Exceed Expectations

After a review of the outstanding results of National Electrical Week for 1957, the N.E.W. Committee has announced plans for an even more far-reaching observance during the week of February 9-15, 1958.

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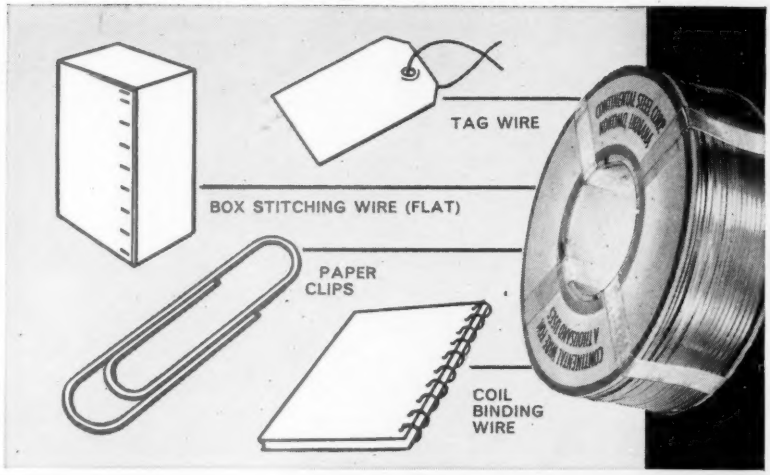
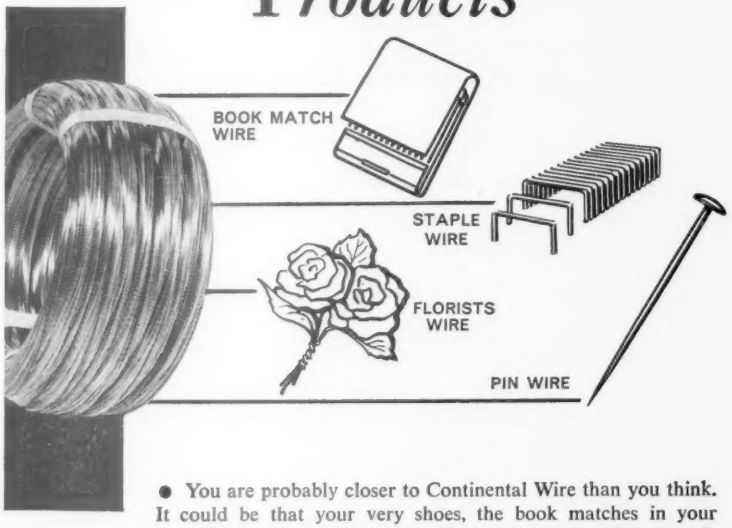
Chairman Merrill E. Skinner reported that 177 state and local N.E.W. committee reports, covering activities during the Week in thousands of cities and towns throughout the United States and Canada, had been received at national committee headquarters.

★ ★ ★

The results for 1957 were outstanding—far beyond any advance expectations, Mr. Skinner reported. They were outstanding from the viewpoint of quantity — the size and extent of the observance—and, of even greater importance, they were outstanding from the viewpoint of value to our industry.



Fine and Specialty Wire for Super Fine Products



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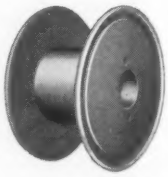

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Gordon Proffitt
World Trade Center
Ferry Building
San Francisco 11, California

Canadian Representative:
Hugh P. Williams & Co.
47 Colburne Street, West
Toronto, Ontario, Canada

APCO MOSSBERG COMPANY
Lamb Street, Attleboro, Mass.

In addition to approving plans for 1958, the national Committee re-elected its officers for a second term of one year. They include Mr. Skinner, vice president and director of sales of **Union Electric Company,** as chairman; **Col. S. R. Todd,** past president, **I.A.E.I.,** as vice chairman; **A. W. Hooper,** executive director, **N.A.E.D.,** as secretary; and **Harold A. Webster,** president, **T. Frederick Jackson, Inc.,** as treasurer.

J & L Enters Stainless Steel Markets

The transfer of the assets and business of **Rotary Electric Steel Company,** Detroit, to **Jones & Laughlin Steel Corporation** is J.&L.'s first move into the stainless steel and high alloy business.

★ ★ ★

Rotary is a producer of stainless steel and alloy ingots, slabs, billets, hot rolled and cold finished bars, rods and some wire products.

★ ★ ★

Rotary's sales last year were $54,000,000. Sales should reach an annual rate of $100,000,000 in the latter part of 1958 or early 1959, according to **Avery C. Adams,** J.&L.'s president.

New High Temperature Cable

The Tensolite Insulated Wire Co., Inc., of Tarrytown, N. Y., has announced the development of an entirely new Teflon-Air Dielectric miniature coaxial cable. The recently developed cable has a nominal O.D. of .220". The conductor is #30 AWG, 7/38 silver plated copperweld.

★ ★ ★

A choice of outer jackets of Teflon, lacquered nylon braid, Teflon or silicone impregnated glass braid, etc., are available as standard constructions. The low attenuation of the 10 MMF cable makes it particularly useful for High Frequency, low level applications and as low capacitance probe cable. Capacitance values of less than 10 MMF, of somewhat larger diameters are available.

Excellent flexibility is a feature of this new cable. Among the other outstanding physical characteristics are solderability, light weight, small size and adaptation to a variety of connectors.

★ ★ ★

For further information, write or call the Tensolite Sales-Engineering Dept., 198 Main St., Tarrytown, N. Y.

Introduces New Wire Rolling Mill

The Fenn Manufacturing Co., producer of metal forming equipment, has introduced a new Rolling Mill, Model No. 042, designed for production rolling of special wire sections. The two-high, pinion gear drive mill, roll diameter 4″, face width 3″, equipped with a vari-speed motor and accessory edger, is in use at **United Wire & Supply Corp.,** Providence, R. I., flattening nonferrous wire. Compact in size, the Model Number 042 can roll nonferrous wire at speeds up to 750 FPM with a maximum separating force of 40,000 to 60,000 lbs. A special oversize bed contains the vari-speed motor, oil sump and coolant tank to conserve floor space. A full line of accessories is available, including grooved or mirror lapped rolls, work entry guides, edgers and take-up reels.

New Wire Trimming Machine

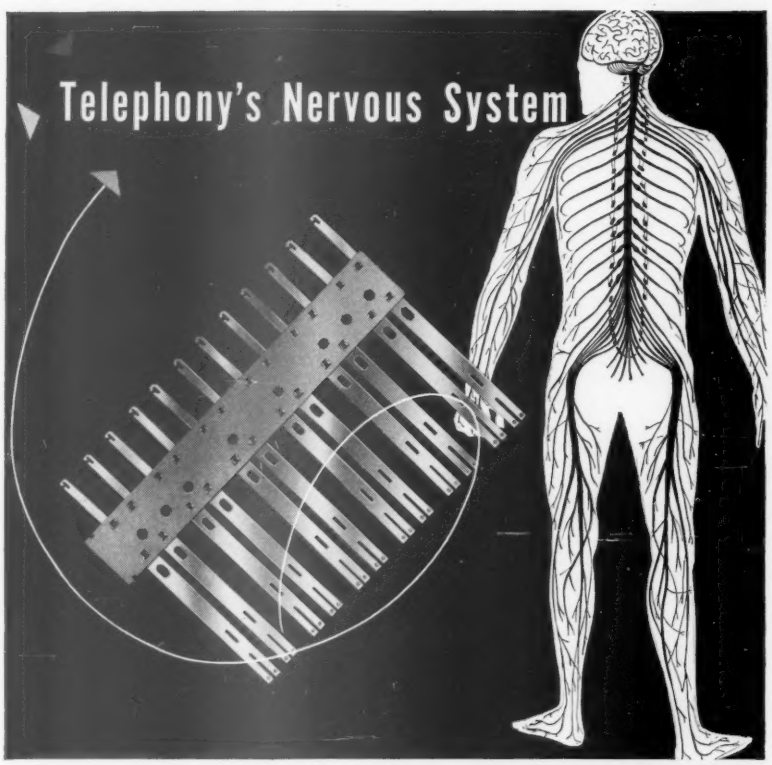
Artys Sales Co., 11 Broadway, New York 4, has announced a new motor-driven Wire Trimming Machine.

★ ★ ★

Designed to meet the great need for a rugged high-speed Wire Trimming Machine, (wire nibbling machine). It is extremely simple to operate. Wire products such as: trays, baskets, shelves, cages, fan guards, etc., are guided by the operator along the cutting die.

★ ★ ★

The machine gives a clean cut-off and operates at 450 strokes per minute. The maximum capacity that can be used is 5/16″ diameter. The machine comes complete with a ¾ H.P. motor. Special dies are available for work on lamp shades, etc.



. . . relies on "neurons" of Seymour Nickel Silver

Dial telephones carry your voice to the ends of the earth through an intricate electrical network which closely resembles the human nervous system. Seymour nickel silver plays a key role in modern communications as part of the North Electric Company "Crossbar Switching System" which automates independent telephone exchanges.

Tiny, neuron-like contacts on North Crossbar switch assemblies rely on flat springs of even-tempered Seymour nickel silver for *trillions* of "makes-and-breaks".

Easy to work, corrosion-resistant and possessing excellent conductivity, Seymour nickel silver has an enviable reputation for quality and uniformity among hundreds of manufacturers who say: — "Specify SEYMOUR. You KNOW it's good!"

Perhaps Seymour metallurgists can help solve your materials problems. Tell us your requirements.

Long distance telephone operators link distant points to the North Crossbar System in Seymour, Indiana.

THE SEYMOUR MANUFACTURING COMPANY
22 FRANKLIN STREET
SEYMOUR, CONNECTICUT

EFFICIENT, MODERN SYSTEMS
FOR
ELECTRICAL WIRE & CABLE MANUFACTURING

• *CABLE LACQUERING SYSTEMS*

Conventional cellulosic, or other type, lacquers are applied in successive continuous coats from one to twenty-eight coats over fibrous braid wrapped primary conductors. One end, four ends, or eight ends of wire are handled continuously. System includes letoff, application, drying and constant tension takeup equipment.

• *WIRE ENAMELING SYSTEMS*

Natural and synthetic enamels, silicones, solution nylon, modified plastisol, and similar insulating coatings are applied to bare, cotton or glass covered wire in round, square or rectangular cross section. Ten or twenty simultaneous strands are handled. Systems are complete with letoff, preannealer, application system, capstan and multiple takeup unit.

• *ASBESTOS INSULATING SYSTEMS*

Carded asbestos is applied to continuous single conductor as an integrated operation with saturating, rotary forming, drying, cooling and polishing of the finished wire. Wire from No. 20 gauge to No. 6 AWG is handled through an asbestos wall thickness range of from .008″ to .040″ thickness in a single pass.

• *RUBBER OR PLASTIC JACKETING SYSTEMS*

Rubber and thermoplastic jacketing compounds are continuously applied to electrical wire or cable by the extrusion method. High speed, constant tension letoff and takeup equipment, controlled cooling or continuous vulcanizing equipment are powered by synchronized range drives as complete, integrated wire handling systems. Extrusion machines of customer's choice are furnished.

• *GLASS & VARNISH COATING SYSTEMS*

Double layer of glass or cotton wrapping is applied to round, flat or square conductor. Two individual coatings of high temperature varnish are applied and the finish baked in a continuous operation. Units are complete from letoffs to takeup frames.

• *SELF TRAVERSING REEL CORD DRYERS*

These ingenious machines are used to remove hygroscopic moisture from fibers, braided or knitted flexible cable. These machines increase extrusion speeds, reduce blister scrap loss and improve diameter control. They are easily installed in existing extrusion line.

TECHNICAL INFORMATION ON ANY OF THESE PROCESSES UPON REQUEST

C. A. LITZLER CO., INC.
1817 BROOKPARK ROAD
CLEVELAND 9, OHIO

Precision Braiding with Hydraulic and Compression Air Tubes

Today we depend more upon hydraulics and compressed air than is generally appreciated. Their uses are so numerous and efficient that the average person is quite unaware of their existence and does not realize how much every day life depends upon them. The aplication of hydraulics and compressed air depends to a large extent upon the hose and tubes carrying the required pressure to the correct points and applying it to such functions as retractery undercarriages on aircraft, motor vehicle brakes, ship building, mining, road making and sometimes the compressed air tubes are used in surgery to eliminate the danger of a spark from an electric tool where combustible anaesthetics are being used.

* * *

A large quantity of high pressure tubes are braided with multiple ends of high tensile steel wire, linen, cotton, nylon, rayon etc. The braiding has to be done as near perfect as possible, otherwise, the pressures they carry would prove to be insufficient and the risk of a burst greatly increased perhaps, with disastrous results.

* * *

B. & F. Carter & Co. Ltd., Waterloo Street, Bolton, have specialized

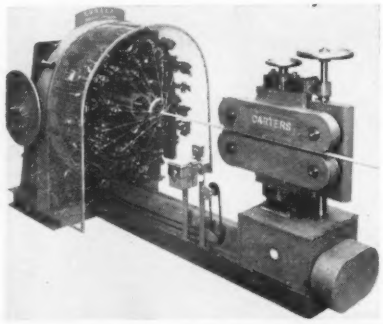


Figure 1. * * * * * * * * * * * * * * *

in braiding machines of this type for over thirty years and have specially designed wire and yarn carriers to meet the exacting requirements of the tubes, demanded

by present day achievements in almost every sphere of hydraulics and compressed air requirements. Fig. 1. shows a 24-carrier wire braiding machine arranged with a twin grip haul-off mechanism; this ensures the tubes are under perfect control and the stitches per inch are maintained throughout the length of the braiding. It is most important that no slip takes place during this operation; otherwise an incorrect pitch of braid would result in a faulty tube. For the braiding of tubes with wire, the machine is equipped with Carter's "Max" wire carriers Mark 2., as illustrated in Fig. 2. It will be noted that the brakes are applied

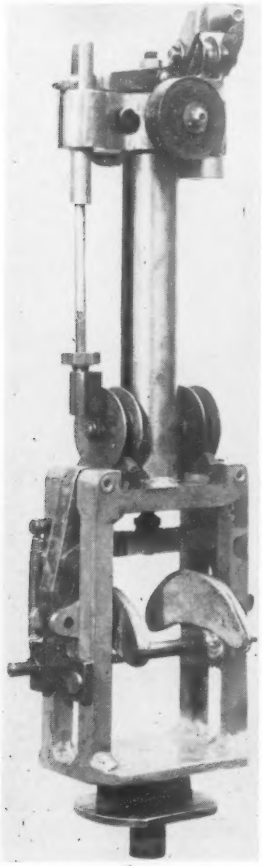


Figure 2.

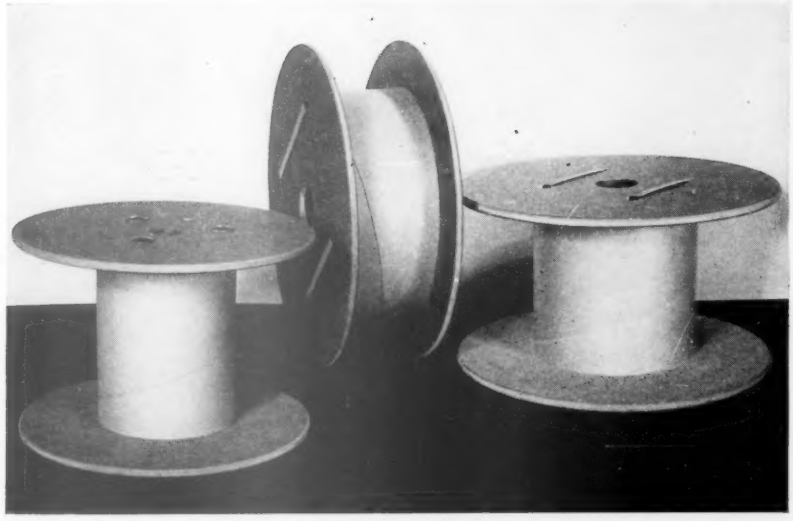
to the side of the bobbin, eliminating "snatch" which would occur with a ratchet type, when the wire is being applied to the braid. To illustrate this point, the chart on page 676 shows actual figures that are unsurpassed in performance.

ESPECIALLY DESIGNED FOR WELDING WIRE AND THE AIRCOMATIC WELDING PROCESS

CARRIS

Non-Returnable Presdwood and Hardboard

SPOOLS



Saves you

COSTLY FREIGHT

HANDLING COSTS

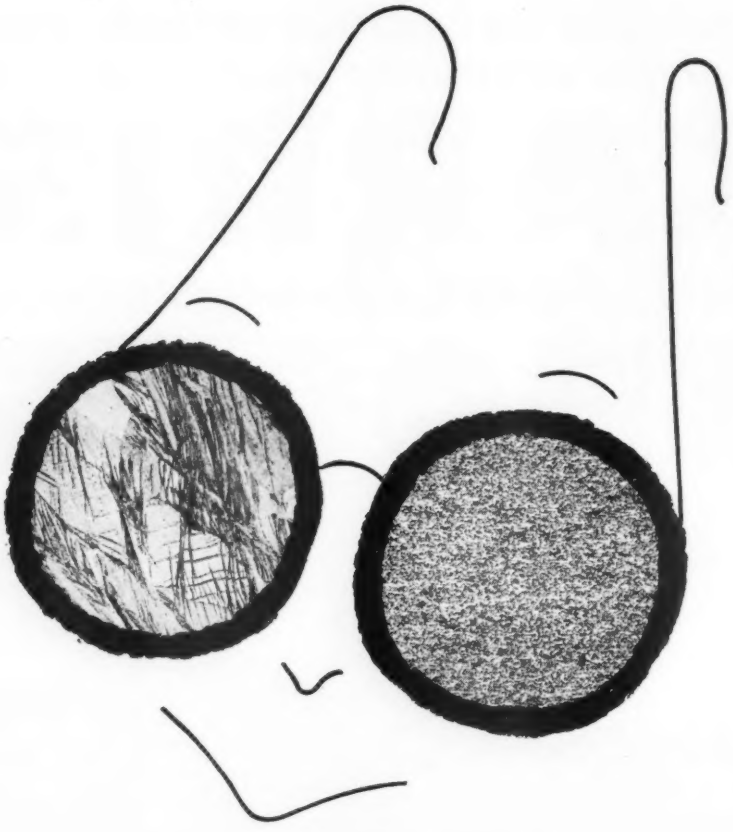
VALUABLE PLANT SPACE

You buy better Non-Returnable Spools when you choose Carris. They wind truer, are more uniform and are designed by men with a practical knowledge of the Wire Industry's needs. Write, wire, or phone Prospect 3-7388 your requirements. Our own trucks give almost instant delivery.

CARRIS REELS, INC.

70 PARK STREET RUTLAND, VERMONT

SPECIALISTS IN THE DESIGN AND MANUFACTURE OF PLYWOOD REELS AND SPOOLS



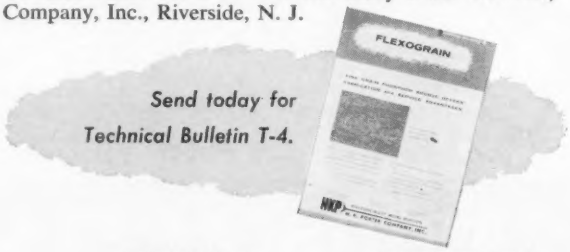
You can see the difference

. . . not with the naked eye, we'll admit . . . nor even with bifocals, but put a polished and etched sample of our new FLEXOGRAIN phosphor bronze under the revealing eye of the microscope and compare it with phosphor bronze strip generally available.

The scientifically controlled, fine grain structure of FLEXOGRAIN is great for severe bending and other complex forming operations . . . improves fatigue resistance, surface finish and ductility . . . and cuts costly fabrication rejects to a minimum.

At Riverside-Alloy we have always been keenly aware of the importance of grain size control in determining functional and fabrication properties of our alloys. We have been supplying fine grain phosphor bronze strip for special applications for over 20 years. Now, with our recently expanded, modern facilities, we can supply production quantities to meet your needs.

For detailed information write to Riverside-Alloy Metal Division, H. K. Porter Company, Inc., Riverside, N. J.



Send today for Technical Bulletin T-4.

ALLOY METAL WIRE
Prospect Park, Pa.

RIVERSIDE METAL
Riverside, N.J.

PRENTISS WIRE MILLS
Holyoke, Mass.

HKP RIVERSIDE-ALLOY METAL DIVISION
H. K. PORTER COMPANY, INC.

"MAX" WIRE CARRIERS

Tension before Release	Tension on Release	Effort to Release Tension
18 lbs.	22 lbs.	4 lbs.

Bobbin Size: 3-3/4" diam., 2" Traverse, and $1\frac{1}{2}$" diam. barrel.

(Referred to on page 675)

A similar type of Braiding Machine is employed when the tubes are braided with cotton, linen, nylon, rayon etc., but the heads are equipped with Carter's No. 4. "Ace" carriers as illustrated in Fig. 3.

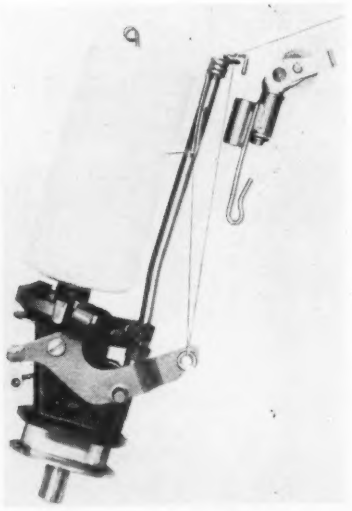


Figure 3. * * * * * * * *

These are suitable for carrying cheeses of yarn 6" traverse x 3" diameter and here, a notable feature is the constant tension at required setting from 12 ozs. to 26 ozs. and from 28 ozs. to 120 ozs. The variation in tension before release and effort to release on this carrier is negligible.

★ ★ ★

The company has announced a new General Catalogue, 5th edition, Part. 1. This illustrates and describes machinery for electric cable, wire rope, rubber manufacturers, etc. A copy will be forwarded upon request.

Outstanding Personalities of the Wire Industry

New Officers Announced by Sleeper & Hartley, Inc.

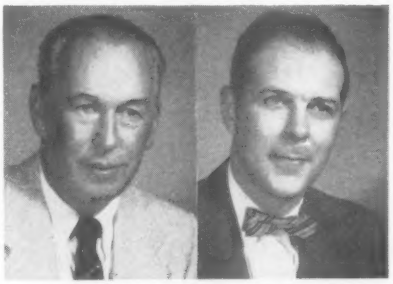
William H. Welch, and **Richard S. Russell** were elected President and Vice President in Charge of Production by the Board of Directors of **Sleeper & Hartley, Inc.,** at its recent meeting in Worcester, Mass.

★ ★ ★

Mr. Welch, who will also continue his duties as Treasurer, will head up the company's rapidly accelebrating sales and promotion program for its full line of spring making machinery. He has been Treasurer of the corporation for the past nine years.

★ ★ ★

Mr. Russell has been a prime mover in the company's greatly increased production capacity which has made possible the addition of the new "Escapement Type" spring making machinery to the Sleeper & Hartley line.



(Left) William H. Welch
(Right) Richard S. Russell

Firth Sterling Announces Promotions

Firth Sterling, Inc. announces the appointment of **Malcolm F. Judkins** as Director, New Product Development. Mr. Judkins was formerly Manager of the New Products Division of Firth Sterling's Sales Department.

★ ★ ★

J. Mabon Childs has been appointed a Product Manager in the Steel Division of Firth Sterling's Sales Department. He will be wholly responsible for the sale of zirconium products, as well as partially responsible for the sale of titanium and induction vacuum melted alloys. Before assuming his new position, he was Assistant to the Vice President-Sales.

★ ★ ★

William J. Ulm, Manager, Customer Service, will assume the additional responsibilities of Assistant to the Vice President-Sales.

Appointed Product Manager

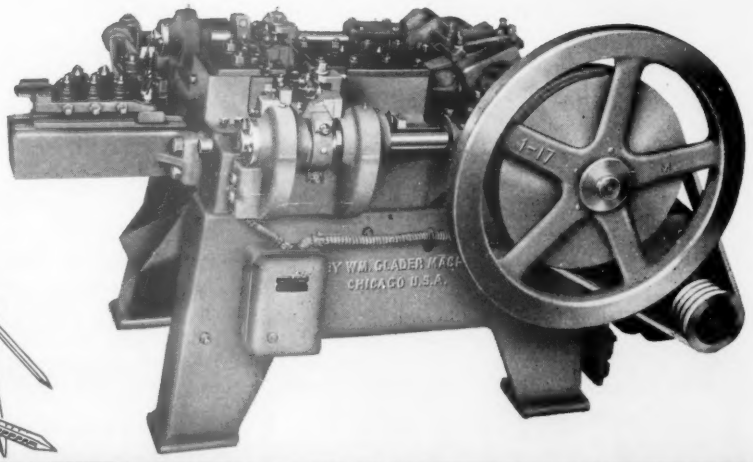
A. E. Sneden has been appointed product manager of the Wire and Cable Division of **National Electric**

Glader—Years of Proven Performance

GLADER NAIL MACHINES

55 YEARS of experience meeting the exacting demands of nail making.

The machine with a record of steady dependable service.



Wm. GLADER MACHINE WORKS 210 N. RACINE AVENUE CHICAGO 7, ILLINOIS

EXPORT DEPT. 122 EAST 42ND STREET • NEW YORK 17, N. Y.

Products Corp. in Pittsburgh. Prior to this appointment, Mr. Sneden was with **Lowel Insulated Wire Co.**, serving two years as manufacturing representative and three years as vice president and director of sales. Previously he had been associated with the **Okonite Company** for 21 years.

David S. Reynolds

David S. Reynolds, New England representative for **The Gas Machinery Company**, Cleveland, Ohio, died at Robert Breck Brigham Hospital in Boston, March 31st. He had been ill for about a year.

★ ★ ★

A Gas Machinery representative since 1949, Mr. Reynolds was instrumental in many outstanding gas installations in New England. His gas experience, all in this area, totalled 54 years. He was a graduate of M.I.T. and had started his long engineering career in 1902.

ACP Appoints Sales Manager

Ellsworth A. Stockbower has been appointed manager of New Product Sales in the Metalworking Chemicals Division of the **American Chemical Paint Company**, Ambler, Pa., as announced by **G. C. Romig**, president of the Company.

★ ★ ★

Mr. Stockbower joined the ACP research laboratory staff in 1947 specializing in RODINE® research,

Ellsworth A. Stockbower

hydrogen embrittlement research and cholesterol production. In 1951, he was made Metalworking Chemicals Technical Service Manager in the Sales Department and was promoted to manager of the ACP Technical Standards Department in 1953.

Lubricant Firm Elects President

Fiske Brothers Refining Co., Newark, N. J., have announced the election of **George E. Merkle** as president.

★ ★ ★

Besides a line of industrial lubricants, the company has been making wire drawing wire rope lubricants for many years.

Wickwire Spencer Appoints District Sales Manager

George C. Jennings has been appointed New York district sales manager of the **Wickwire Spencer Steel Div.** of **The Colorado Fuel and Iron Corp.**, it was announced late in March by **L. A. Watts**, General Manager of Sales, Eastern Division. Mr. Jennings succeeds **C. K. Pattison**, who will handle special assignments for the corporation.

★ ★ ★

Prior to his new appointment, Mr. Jennings was assistant district sales manager of Wickwire Spencer's Buffalo district. Mr. Jennings

HERE ARE 5 GOOD REASONS
FOR USING Rinkle Krinkle
Spiral Wrap
1. Only No. 1 Northern Kraft Paper is used in the manufacture of Rinkle Krinkle Spiral Wrap.
2. Rolls can be supplied in any weight, width, or diameter.
3. It is manufactured by a company that has 30 years experience making spiral wrap exclusively.
4. Items wrapped with Rinkle Krinkle Spiral Wrap are very attractive, which greatly increases sales appeal.
5. Five types available include Krinkle Kraft, Krinkle Waxo, Krinkle Waterproof, Krinkle Nylon Reinforced, and Krinkle Resin Laminated.
If you use Rinkle Krinkle Spiral Wrap once, you will want to use it every time.
Rinkle Krinkle Paper Company
MEMBER WAS
326 A STREET, BOSTON 10, MASS.

has been with the corporation since 1946, serving in various capacities in the Buffalo district.

★ ★ ★

Mr. Jennings will maintain offices at CF&I's executive offices, 575 Madison Avenue, New York. Mr. Pattison will operate from the corporation's offices at 40 Colorado Street, Clifton, New Jersey.

Storchheim Heading Metals Research Firm

Samuel Storchheim has left the Nuclear Division of **The Glenn L. Martin Company** of Baltimore, Md., where he was Chief of Nuclear Manufacturing Engineering and Research to become President and Technical Director of the **Metals Research and Development Corp.** of Exeter, Pa. This Corporation will act as a laboratory and consulting service to private industry and Governmental agencies and will perform R&D work in the metals, cements, and ceramics areas. The laboratory will specialize in nuclear reactor core component work and such fields as: powder metallurgy, wire, bonding, high temperature alloys, refractory metals, rare earth metals, etc.

Suba Appointed Manager Extrusion Materials Div., Bakelite

Michael M. Suba has been appointed Manager, Extrusion Materials Division of **Bakelite Company,** a Division of **Union Carbide and Carbon Corp.,** it is announced by **J. D. Benedito,** Vice President in Charge of Sales.

★ ★ ★

Mr. Suba will be responsible for the sales of Bakelite extrusion compounds, including vinyls, polyethylene and polystyrene, for wire and cable jacketing and insulation, for pipe, garden hose, tubes, sheets and monofilaments. Mr. Suba, a graduate of Rutgers University, joined the company in 1933 and was previously assigned to the Hartford office as a technical representative for the Extrusion Materials Division.

Standard Industrial Elects Officers

At the annual meeting of stockholders and directors of the **Standard Industrial Compounds Company** of Frankfort, Ill., the following officers were elected for the coming year: **John Moritz,** President; **Earl Bowers, Jr.,** Vice President; **Bruce Siemon,** Treasurer; and **Wallace G. Solum,** Secretary.

★ ★ ★

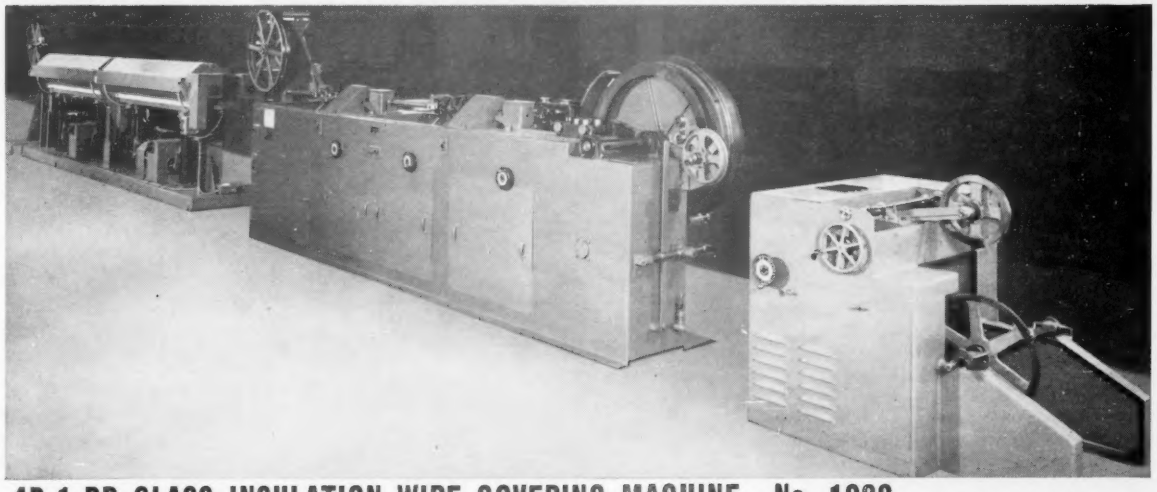
The company is one of the leading manufacturers of wire drawing compounds and other metal processing materials.

Cleveland Tramrail Appoints Sales Executive

John G. Frischkorn has been appointed Assistant Sales Manager of the **Cleveland Tramrail Division of The Cleveland Crane & Engineering Co.,** Wickliffe, Ohio, by **A. F. Anjeskey,** Sales Manager.

★ ★ ★

Mr. Frischkorn has had sixteen years' experience with Cleveland Tramrail as design engineer for



4D-1-BB GLASS INSULATION WIRE COVERING MACHINE No. 1088 Patented Aug. 3, 1943

WITH VARIABLE SPEED DRIVE.
TORQUE MOTOR DRIVEN TAKE-UP REEL STAND
BALL AND ROLLER BEARING MOUNTED
BAKING OVEN WITH DOUBLE VARNISH APPLICATOR
AND AUTOMATIC TEMPERATURE CONTROLS.

WIRE DRAWING, ENAMELING, TINNING, INSULATING,
TAPING, GLASS-COVERING, PANNING AND ALLIED MACHINERY

EST. 1855 AIMco INC. 1915
"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.
FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33 PENNSYLVANIA U.S.A.

overhead materials handling equipment. He also was with the Euclid Crane & Hoist Company for five years where he served in engineering and sales capacities, including Sales Manager. For the past year he has been District Sales Manager covering West Virginia, Pennsylvania, New York and eastern Canada.

Waterbury-Farrel Elects Directors and Officers

At the annual meeting of the **Waterbury Farrel Foundry & Machine Co.** on March 7, 1957, besides electing directors, at the Directors meeting following the Annual meeting, these officers were elected: Chairman of the Board, **F. S. Van Valkenburg;** President, **A. D. Mitchell;** Vice Presidents, **R. C. Bannon, Tadeusz Sendzimir** and **F. S. Van Valkenburg;** Secretary, **E. S. Wotkyns;** Asst. Secretary, **H. C. Griggs;** Treasurer, **A. D. Patterson; Asst.** Treasurer, **J A. Gute,** and Comptroller, **T. E. McLaughlin.**

Carboloy Representative Moved to Detroit to Handle Engineering

Grant A. Morrison, formerly Carboloy cemented carbide component parts representative in the Houston, Tex., area for General Electric's Metallurgical Products Department, recently transferred to Detroit as engineering administrator in the organization's engineering section.

★ ★ ★

Mr. Morrison joined General Electric in 1951, handling several marketing assignments in the southwest, prior to making his headquarters in Houston. He is a mechanical engineering graduate from Lawrence Tech.

Bakelite Names Hartford Representative

The appointment of **Charles Lowe** as a technical representative for the Extrusion Materials Division in the Hartford office is announced by **Bakelite Company,** a Division of Union Carbide and Carbon Corp.

★ ★ ★

In his assignment, Mr. Lowe will be responsible for sales and customer service of Bakelite polyethylene, vinyl, polystyrene and fluorothene plastics for extrusion in the territory that includes Maine, New Hampshire, Vermont, Rhode Island, Massachusetts and Connecticut.

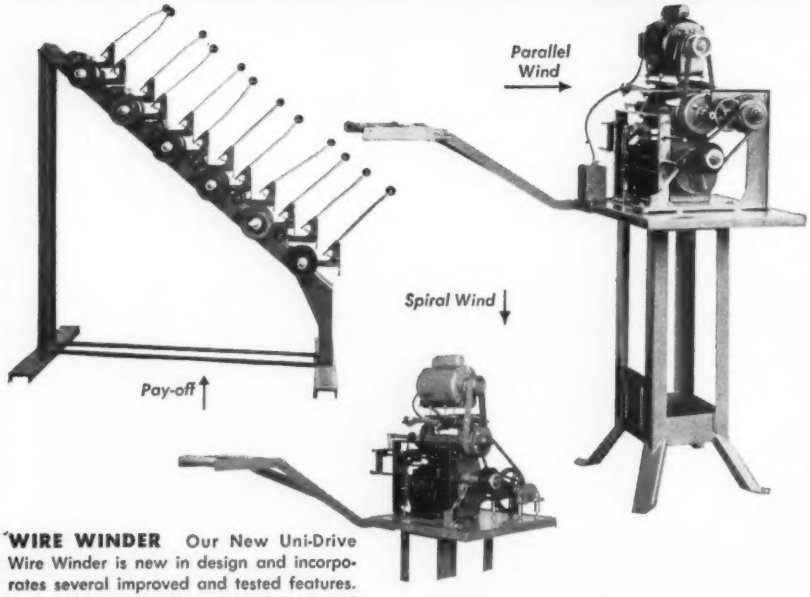
Roebling Appoints New York Sales Manager for Wire Rope Division

Earl A. Frazier has been appointed New York district sales manager for the Wire Rope and Aircord Division of **John A. Roebling's Sons Corp.,** it was announced recently by **W. A. Huber,** General Product Manager. Mr. Frazier will have his headquarters in New New York and will be in charge of the division's sales activities covering New York, northern New Jersey, and New England.

★ ★ ★

Mr. Frazier, formerly Cleveland district sales manager, has been associated with Roebling since 1938. A native of Hagerman, Idaho, he attended the University of Idaho.

STANDARD UNI-DRIVE WIRE WINDER



WIRE WINDER Our New Uni-Drive Wire Winder is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel — no over or under-winding. Can also be furnished with a slight spiral pattern for winding exceedingly fine wire. Automatic Stop Motion controls each strand. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors.

Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAY-OFF Our Pay-off Attachment consists of a heavy fabricated frame on which Pay-off spools are mounted to cover desired number of ends to be wound. Equipped with spindles, running on self-aligning ball bearings, with size of spindles and adapters to accommodate customers' pay-off spool. Compensating Attachment to control the tension of each individual strand of wire, applying the same tension when spool is full as when empty. Can also be adapted for use with bunching machines.

STANDARD MILL SUPPLY COMPANY
31 ESTEN AVENUE PAWTUCKET, R. I., U. S. A.

Wilbur B. Driver Personnel Changes

The election of seven officers by **The Wilbur B. Driver Co.,** Newark, N. J., has been announced by Robert O. Driver, President.

★ ★ ★

These changes of status are as follows:

Sidney A. Wood, formerly Vice President, Sales, is now Executive Vice President.

William J. Wind, formerly Vice President in Charge of Manufacturing, has been made Senior Vice President.

Norman P. Norlie, formerly Sales Manager, has been elected Vice President, Sales.

H. Clark Smith, Jr., who had been Technical Director, is now Vice President in Charge of Research and Engineering.

Raymond O. Hallberg, General Superintendent, has been elected Secretary of the company.

Samuel Rankin, formerly Auditor, is now Treasurer.

Robert W. Judkins, Technical Assistant to the President, was named a director of the company.

★ ★ ★

The Wilbur B. Driver Co. manufactures precision alloys for electronic, electrical, mechanical and chemical applications.

To Manage Prentiss Wire Mills

John R. Fuller was recently appointed Manager of the Prentiss Wire Mills, **Riverside-Alloy Metal Div., H. K. Porter Co.,** Holyoke, Mass.

Igoe Appoints Sales Manager

Hugh A. Cole, Executive Vice President of **Igoe Brothers, Inc.,** Newark, N. J., has announced the appointment of **Ralph C. Martin** as Sales Manager of the Manufacturing Division. He has been with the company since 1939 as District Manager, having been with American Steel & Wire for the preceding six years.

★ ★ ★

Mr. Martin will direct the sales of products produced at Newark and of those carried in the company's new warehouse at Woodside, N. Y. These include galvanized, bethanized, spring and bright basic wire, rivets, nails and straightened and cut wire.

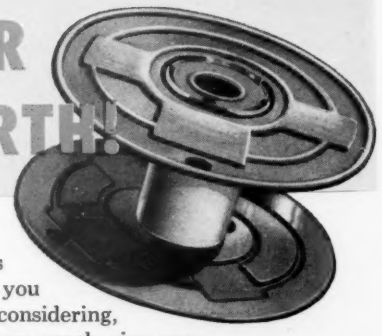
Leslie Joins Morgan Construction

The Morgan Construction Company, Worcester 5, Mass., has announced the appointment of **Frederick W. Leslie** as Sales Engineer in the Wire Machinery Department.

Mr. Leslie had been with the **G. F. Wright Steel and Wire Co.** since 1941 and was General Superintendent at the time of his resignation. He is a member of The Wire Association and is widely known in the industry. His many friends will wish him every success in his new responsibilities, for which his long experience in wire production equips him admirably to serve.

If you use lightweight, non-returnable spools

GET ALL YOUR MONEY'S WORTH!



Only Masonware non-returnable spools offer you all these advantages in stock models. Compare the spool you are now using, or the spool you are considering, against this chart. See why Masonware spools give you *more* for your money. Then contact Masonware for full details on Masonware non-returnable spools.

	Masonware Spools	Brand A	Brand B
Lower Cost	✓		✓
Resists Crushing	✓	✓	
New, Lock-tight Construction	✓		
Heavily Tinned Barrel (inert & non-corrosive)	✓		
Light-Weight	✓		✓
Lithographed by Manufacturer	✓	✓	
Long Experience	✓	✓	

Use Masonware lightweight, non-returnable spools for

INSULATED WIRE
THERMO-COUPLE WIRE
TV LEAD-IN WIRE
AUTOMOTIVE CABLE
SOLDER WIRE
WEATHER STRIPPING
PLASTIC TUBING

MASONWARE SPOOLS AVAILABLE IN 3¾", 5", 6½", 8½" and 10½" head sizes; 1⅞" standard barrel diam.; 3½" barrel diam. available for 10½" head only; barrel lengths from ⅝" to 14"; special sizes fabricated from your dies.

Let us solve your spool problem! Write, wire or call

MASONWARE COMPANY

1949 Dexter Road, East Providence, R. I. • Phone GEneva 4-2810
Branch Plant—Greenville, Ohio

Elected Vice President of ACP

American Chemical Paint Co., Ambler, Pa., has elected **George H. Williamson** Vice-President in charge of West Coast activities, including the ACP Plant at Niles, Calif.

★ ★ ★

Mr. Williamson has been associated with the company since 1935. In 1952, when ACP expanded its manufacturing, sales and service facilities to meet the expanding demands of the metalworking industry throughout the West Coast territory, he was transferred from the Detroit branch to the new plant at Niles.

★ ★ ★

His new responsibilities will include supervision of all ACP activities at Niles.

Joins Rockbestos Products

Capt. William L. Pryor, Jr., U.S.N., Ret., has joined **Rockbestos Products Corporation,** New Haven, Conn., manufacturers of insulated wires and cables. He will be on special assignment, reporting to **Albert S. Redway,** Rockbestos president.

Versatility in Forming-

NILSON 4-SLIDES . . .

Simple or complex metal forms in wire or ribbon metal is no problem on a Nilson. Tooling for basic forming can be augmented by provision for operation such as welding, assembling or swaging. Open design on all forming elements provides for quick tool change and easy adjustment even from wire to metal forming on the one machine that does so many jobs so well. The universal Nilson 4-Slide is the economical answer to your forming problems. Size ranges—wire up to ½" dia. in feeds to 32" max., ribbon stock up to 3½" wide. 5 to 75 ton press sections. Our specialists can assist you in all types of forming requirements.

THE A. H. NILSON MACHINE CO.
1516 BRIDGEPORT AVE. • SHELTON, CONN.

NILSON

He retired at the end of March as Commanding Officer and Director, U.S.N. Shipbuilding Scheduling Activity, Philadelphia. Since World War II, he has had charge of electronics at the Norfolk Naval Shipyard, commanded the U.S.N. Underwater Sound Laboratory, served as Director of Research and Development of the Navy Bureau of Ships and commanded the U.S.N. Ship Repair Facility, Yokosuka, Japan, the largest naval shipyard in the Far East.

★ ★ ★

He is a graduate of the U.S. Naval Academy with a B.S. degree in Electrical Engineering. He also completed two years of post graduate work at Harvard University and received a master of science degree in communication engineering.

Horton to Represent Entwistle

The recent appointment of **Robert D. Horton** as sales engineer was announced by the **Entwistle Manufacturing Corp.,** 1475 Elmwood Avenue, Providence 7, R. I. Mr. Horton assumes the new post of midwestern and western representative for Entwistle Wire Machinery, Fluid Power Equipment and Electronic Tube Machinery. He has served the company for the past seven years as plant inspector and field service representative.

To Manage Spring Production

The appointment of **Charles W. Darby** to the newly created position of Production Manager of the Spring Division, **Crucible Steel Company of America** has been announced by **T. T. Crowley,** General Manager. Mr. Darby will be responsible for all production, quality control and maintenance activities of the Division, which produces coil and elliptic springs for industrial and railroad applications. He will be located at Spring Division headquarters, 1 McCandless Ave., Pittsburgh, Pa.

★ ★ ★

Mr. Darby received a B.S. degree in Metallurgical Engineering from Lehigh University, Bethle-

hem, Pa. in 1940. He joined Crucible upon graduation and has served as a metallurgist at Park Works, Pittsburgh; supervisor of federal regulations; product service engineer in the Alloy and Carbon Division; and as a staff metallurgist in the central metallurgical office in Pittsburgh.

Made Manager of Reynold's Parts Division

Nils H. Lou has joined **Reynolds Metals Co.** as manager of manufacturing for the company's Parts Division in Louisville, Ky., it was announced by **William G. Reynolds,** vice president.

★ ★ ★

He comes to Louisville from Republic Aviation Corp., where he has been since 1952, serving first as chief manufacturing engineer and more recently as works manager.

Revere Corp. Announces Appointments

Raymond W. Ayers has been named sales manager and **Peter R. de Bruyn** application engineering manager of **Revere Corporation of America,** Wallingford, Conn., manufacturer of aircraft and industrial components and systems.

★ ★ ★

Mr. Ayers, a graduate of the University of Illinois, was formerly manager of the Industrial Division of North Electric Co., Galion, Ohio. Prior to that he was executive vice president and general manager of Allen D. Cardwell Manufacturing Corp. of Plainville, Conn.

★ ★ ★

Mr. de Bruyn, formerly with United Aircraft Corporation, East Hartford, is a graduate of Stevens Institute of Technology and a registered professional engineer in Connecticut. He will be responsible for organizing and directing the new application engineering section of the sales department, created to provide closer technical liaison between the factory and Revere customers.

Elected Fellow in AIEE

Victor Siegfried, Chief Engineer, **Ansonia Wire & Cable Co.,** Ashton, R. I., was among sixteen electrical engineers and educators recently elevated to the grade of Fellow in the American Inst. of Electrical Engineers.

Metal and Thermit Appointments

Dr. C. K. Banks, Vice President in Charge of Research and Development, Metal and Thermit Corp., Rahway, N. J., has announced appointments as follows: **Carl R. Gloskey,** Manager of Process Development Div., **Dr. F. A. Lowenheim,** Technical Advisor to Dr. Banks, and **R. W. Couch,** Manager of Electrochemical Research and Development.

★ ★ ★

Mr. Gloskey is a graduate of Rutgers University and has been with the company since 1946; Dr. Lowenheim, who holds a PhD degree from Columbia, has been with MIT since 1936; and Mr. Couch, a graduate of Wayne State University, joined the company in 1941. He will manage the company's laboratories in Detroit.

Standardize on ACROPAK* Spools!

Only ½ the Weight!

Light Weight
Precision built
Reduced cost
Longer life
Extra strength
Dynamic balance
Greater production
Low cost reconditioning
Less maintenance
Attractive packaging

YET STRONG, TOUGH, RIGID . . *LONGER LIFE*

ACROPAK Spools will help you cut wire packaging costs because they give longer service, require less maintenance and cost less to ship. They're strong. They'll take repeated shippings and still run true on the arbor. They're machined to close tolerances. You can run them at high production speeds with fewer snags, less toe-out and minimum end breakage.

THEY CUT YOUR SPOOLING COSTS

Best proof of ACROPAK superior performance are the millions of these spools now used by the biggest names in the wire industry. We've proved it to them—let us prove it to YOU.

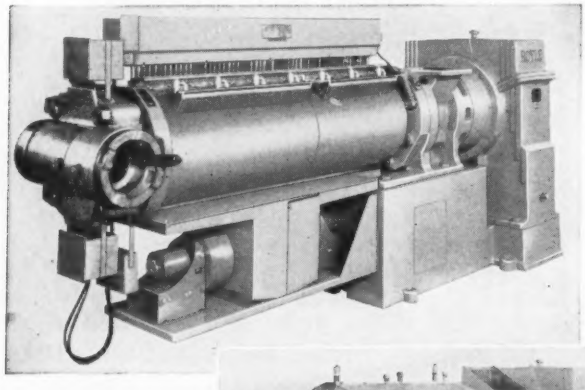
★ We also make a complete line of heavy-duty shop processing STEEL SPOOLS built to the same high standards of accuracy and rigidity as the famous Acropak aluminum spools.

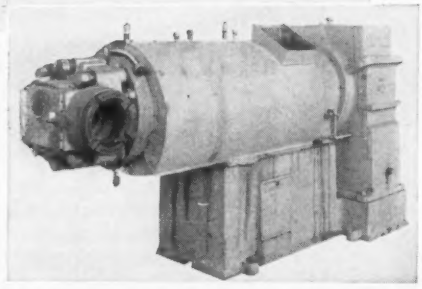
ACROMETAL PRODUCTS INC.
616 5th Street North, Minneapolis 1, Minn.

COPPER - Consumption of refined copper in the United States, January-February 1957, in short tons

	Wire mills 1/	Brass mills 2/	Chemical plants	Secondary copper smelters	Foundries and miscellaneous	Total
January:						
Cathodes	666	7,786	(3)	66	(3)	8,518
Wire bars	70,601	5,942	(3)	---	(3)	76,543
Ingots and ingot bars	1,706	7,613	(3)	107	(3)	9,426
Cakes and slabs	------	15,711	(3)	2	(3)	15,713
Billets	------	14,447	(3)	---	(3)	14,447
Other	------	------	(3)	40	(3)	40
Total	72,973	51,499	(4)	215	(4)	4/127,687
February:						
Cathodes	473	6,605	(3)	42	(3)	7,120
Wire bars	62,421	4,852	(3)	---	(3)	67,273
Ingots and ingot bars	1,495	6,976	(3)	144	(3)	8,615
Cakes and slabs	------	14,057	(3)	---	(3)	14,057
Billets	------	11,934	(3)	---	(3)	11,934
Other	------	------	(3)	72	(3)	72
Total	64,389	44,424	(4)	258	(4)	4/112,071

1/ Includes all wire mills with rod-rolling facilities. 2/ Includes all brass mills using copper in refinery shapes; some have rod-rolling facilities. 3/ Not available. 4/ Consumption by chemical plants, foundries, and miscellaneous plants not included. Estimate of 3,000 tons included in total.





8½" Spirod extruder with side delivery head for jacketing. Up-graded from circulating type shown to the right.

EVER THINK OF UP-GRADING TO SPIROD®?

Yes, it can be—and is being—done. And Royle's traditional approach to extruder development, the retention of features that have stood the test of time, makes it possible. The one-piece cylinder with built-in hopper is replaced by a separate cast steel hopper section, a cast steel cylinder with deep grooves that create fin-like separations for the rod type heating elements and the selective evaporative cooling equipment. Head and stock screw, as usual, are designed for process requirements.

If you are operating an older type Royle extruder you should investigate up-grading to Spirod—the electrically heated extruder with high velocity evaporative cooling—for maximum efficiency in controlled operating temperatures.

Write for Bulletin # 463

JOHN ROYLE & SONS ROYLE PATERSON N. J. 1880

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London, England — James Day (Machinery) Ltd. — Hyde Park 2430 - 0456
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Los Angeles, Cal. — H. M. Royal, Inc. — LUdlow 9-3261
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AMERICAN IRON AND STEEL INSTITUTE
150 EAST FORTY-SECOND STREET, NEW YORK 17, N. Y.

AIS 10

Total Number of Companies Included 128

MARCH - 1957
Month

SHIPMENTS OF STEEL PRODUCTS
ALL GRADES INCLUDING CARBON, ALLOY AND STAINLESS
(Net Tons)

Covering Net Shipments (Excluding Shipments to Members of the Industry for Conversion into Further Finished Products or for Resale)

Steel Products	Item	CURRENT MONTH 1957 Carbon	Alloy	Stainless	Total	Percent of Total Shipments	Prior Year (1956) Percent of Total Shipments	YEAR TO DATE 1957 Carbon	Alloy	Stainless	Total	Percent of Total Shipments	Prior Year (1956) Percent of Total Shipments
Ingots and Steel Castings	1A	20,982	20,186	1,497	42,665	0.6	1.1	* 72,256	52,095	5,513	* 129,864	0.6	1.0
Blooms, slabs, billets, sheet bars	1B	233,454	47,989	2,502	283,945	3.6	2.8	545,500	134,872	7,534	687,906	3.0	2.9
Tube rounds	1C	9,018	357	-	9,375	0.1	-	24,236	1,449	-1	25,734	0.1	-
Skelp	2	11,993	-	-	11,993	0.2	0.2	56,771	-	-	56,771	0.3	0.2
Wire rods	3	86,531	1,988	373	88,892	1.1	1.3	264,951	5,749	1,350	272,050	1.2	1.3
TOTAL SEMI-FINISHED		361,978	70,520	4,372	436,870	5.6	5.4	* 963,764	194,165	14,396	* 1,172,325	5.2	5.4
Bars—Hot rolled (incl. light shapes)	14	629,906	132,091	5,740	767,737	9.8	10.6	1,845,180	419,924	17,925	2,283,029	10.1	10.7
Bars—Reinforcing	15	239,516	-	-	239,516	3.1	2.6	698,529	329	-	698,858	3.1	2.5
Bars—Cold finished	16	98,083	24,215	5,783	128,081	1.6	2.2	312,237	69,165	17,808	399,260	1.7	2.2
Tool steel	17	1,577	8,555	-	10,132	0.1	0.1	3,871	24,900	-	28,771	0.1	0.1
TOTAL BARS AND TOOL STEEL		969,082	164,861	11,523	1,145,466	14.6	15.5	2,859,867	514,318	35,733	3,409,918	15.0	15.6
Wire—Drawn	23	224,640	4,311	2,424	231,375	3.0	3.5	675,229	13,053	7,513	695,795	3.1	3.5
Wire—Nails & staples	24	41,566	-	1	41,567	0.5	0.7	117,955	-	2	117,957	0.5	0.7
Wire—Barbed & twisted	25	8,347	-	-	8,347	0.1	0.1	19,853	-	1	19,854	0.1	0.1
Wire—Woven wire fence	26	24,055	-	-	24,055	0.3	0.4	67,025	-	-	67,025	0.3	0.4
Wire—Bale ties	27	6,789	-	-	6,789	0.1	0.1	12,574	-	-	12,574	-	-
TOTAL WIRE & WIRE PRODUCTS		305,397	4,311	2,425	312,133	4.0	4.8	892,636	13,053	7,516	913,205	4.0	4.9
Black plate	28	76,766	-	-	76,766	1.0	1.1	203,730	-	-	203,730	0.9	1.0
Tin & terne plate—hot dipped	29	113,593	-	-	113,593	1.5	1.4	264,407	-	-	264,407	1.2	1.2
Tin plate—Electrolytic	30	618,827	-	-	618,827	7.9	7.2	1,518,327	-	-	1,518,327	6.7	6.0
TOTAL TIN MILL PRODUCTS		809,186	-	-	809,186	10.4	9.7	1,986,474	-	-	1,986,474	8.8	8.2
Sheets—Hot rolled	31	730,196	19,992	2,453	752,641	9.6	10.3	2,237,660	86,976	6,60,	2,330,240	10.2	10.7
Sheets—Cold rolled	32	1,007,536	3,394	14,843	1,025,773	13.1	16.1	* 3,296,764	12,318	42,019	3,341,100	14.7	16.8
Sheets—Galvanized	33	206,947	-11	-	206,836	2.6	3.5	647,780	-	-	647,770	2.9	3.6
Sheets—All other coated	34	18,299	-	-	18,299	0.2	0.3	55,195	-	-	55,195	0.2	0.3
Electrical sheets & strip	36	8,885	50,649	-	59,534	0.8	1.0	27,969	155,751	-	183,720	0.8	1.1
Strip—Hot rolled	37	129,584	2,663	693	132,940	1.7	2.1	416,244	9,937	1,906	427,087	1.9	2.3
Strip—Cold rolled	38	87,076	1,320	18,077	106,473	1.4	1.9	* 274,900	4,770	7,962	287,632	1.5	2.0
TOTAL SHEETS AND STRIP		2,188,423	78,017	36,066	2,302,496	29.4	35.2	6,946,521	269,752	100,391	7,323,654	32.3	36.7
TOTAL SHIPMENTS (1957)		7,307,091	452,870	61,655	7,821,616	100.0	XXX	*21,143,705	*1,359,904	196,172	*22,699,781	100.0	XXX
TOTAL — PRIOR YEAR (1956)		7,620,710	576,826	58,288	8,255,824	XXX	100.0	21,460,342	1,667,794	178,632	23,307,273	XXX	100.0

* Revised

The Difference

IS HERE.....

NEW MPS CONVOLUTE DURA CURL RIMS...

The difference between just any spool or reel and Superior MPS CONVOLUTE DURA CURL Rims is well worth your close attention. Because now, with this exclusive MPS feature, maximum strength and rigidity are obtained throughout the reel heads. You can now have continuous trouble free high speed winding, without spool straightening expense. These new MPS spools also have the famous **No-Crev** feature.
Ask about MPS CONVOLUTE DURA CURL RIMS today. We invite your inquiries.

MPS CONVOLUTE Dura Curl Spools & Reels give you brute strength with dimensional precision, concentricity, and balance. Another patented MPS development engineered to **help you!**

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Mossberg PRESSED STEEL Corporation

#110

PRIMARY ALUMINUM PRODUCTION
IN THE UNITED STATES
(in short tons)

1957	
March	135,733
February	* 119,059
Total for the year through March	401,822
1956	
March	145,895
Total for the year through March	419,051
All-time record month	
July 1956	151,624
All-time record quarter	
4th 1956	442,597

* Revised from previous report

Wire Products Firm Expands

Ground floor space totaling approximately 13,000 square feet in the Botany Mills Industrial properties at Passaic, N. J. has been leased for a term of years to the **Melrose Wire Products, Inc.,** of 625 River Dr., Garfield, N. J.

After extensive alterations, Melrose Wire will use the space, located in buildings 2-B and 3-B for the manufacture, processing, warehousing and shipping of wire and metal products. Melrose Wire is beginning partial operations at the location immediately and will be in full operation there by June 1st.

P-3 Insulation Tester

New P-3 Insulation Tester Combination Developed

This instrument combines a Sensitive Hipot Tester with a Fault Indicator and Counter for continuous production use in the manufacture of insulated wire or other material. This dual unit allows the testing of two distinct types of insulation faults: pinholes and substandard insulation.

★ ★ ★

Having two separately variable power supplies it becomes possible to discriminate between the two types of faults which are voltage sensitive. By energizing the forward electrode with a suitably low potential (100 volts) and the following electrode with high voltage (up to 20,000 volts) we obtain separate indications and counts for both pinholes and substandard insulation: thin spots, contaminated insulating material or lack of centering of a wire within plastic insulation.

★ ★ ★

For further information, please contact Peschel Electronics Inc., at 15 Garden St., New Rochelle, N. Y.

Get the habit of reading regularly
WIRE AND WIRE PRODUCTS
The Wire Man's Magazine

CUT WIRE PLATING COST!
maintain uniformity on copper and aluminum wire
CONTINUOUS U.I.E.C. ELECTROPLATING EQUIPMENT
This low cost equipment performs uniform high quality work at speeds that mean real savings. Simple to operate. We furnish complete installation.
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A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50¢ for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,787,653, ELECTRIC CABLES, patented April 2, 1957 by Harold F. Ormerod, Yonkers, N. Y., assigner to Anaconda Wire and Cable Company, a corporation of Delaware.

A preformed electric cable is disclosed comprising three relatively stiff metallic conductors helically wrapped together, each of two of said conductors being surrounded by a cylindrical layer of insulating material, the third being bare, the cylindrical insulation of one insulated conductor being integrally united to the adjoining cylindrical insulation of the other insulated conductor, and a bare conductor lying adjacent both insulated conductors throughout the length of the cable and the conductor extending the length of the cable in helical paths of equal and uniform pitch and radius, whereby tensile stresses in each are equalized during aerial suspension of the cable.

★ ★ ★

No. 2,788,616, CLEANING PLANT, FOR EXAMPLE FOR DE-RUSTING WIRE AND THE LIKE, patented April 16, 1957 by Hans K. F. Schulz and Albert Berninger, Budenheim (Rhine) Germany, assignors to Chemische Fabrik Budenheim Altiengesellschaft, Budenheim (Rhine), Germany.

There is disclosed apparatus for descaling and de-rusting wire and metal band material, comprising a number of cleaning rollers of textile material between which the material passes, the frictional contact between the material and rollers driving the rollers, the rollers being arranged successively along the path of the material, and rotated at different speeds by the pull exerted by the passing material.

★ ★ ★

No. 2,788,790, QUENCH POT FOR WIRE AND THE LIKE, patented April 16, 1957 by Harold H. Jordan, Cleckheaton, England, assignor to The Trauwood Engineering Company, Cleveland, Ohio, a corporation of Ohio.

Tube circulation of the quench liquid is said to prevent the formation of hot spots at the work entering end of the quench pot. The tube is rotatably connected with a quench liquid circulating pump and may be lifted from the pot without operative disconnection so as to permit inspection and observation of the flow of quench liquid therethrough.

No. 2,788,807, SPRING WINDING MACHINE, patented April 16, 1957 by Peter M. Sampatacos, Torrington, and Edward E. Franks, Jr., Litchfield, Conn., assignors to The Torrington Manufacturing Company, Torrington, Conn., a corporation of Connecticut.

This patent is for a machine of the gear segment type in which the lengths of wire are successively connected with a rotatable arbor and coiled thereon. The patent is related to patent 2,697,470, dated Sept. 24, 1954.

★ ★ ★

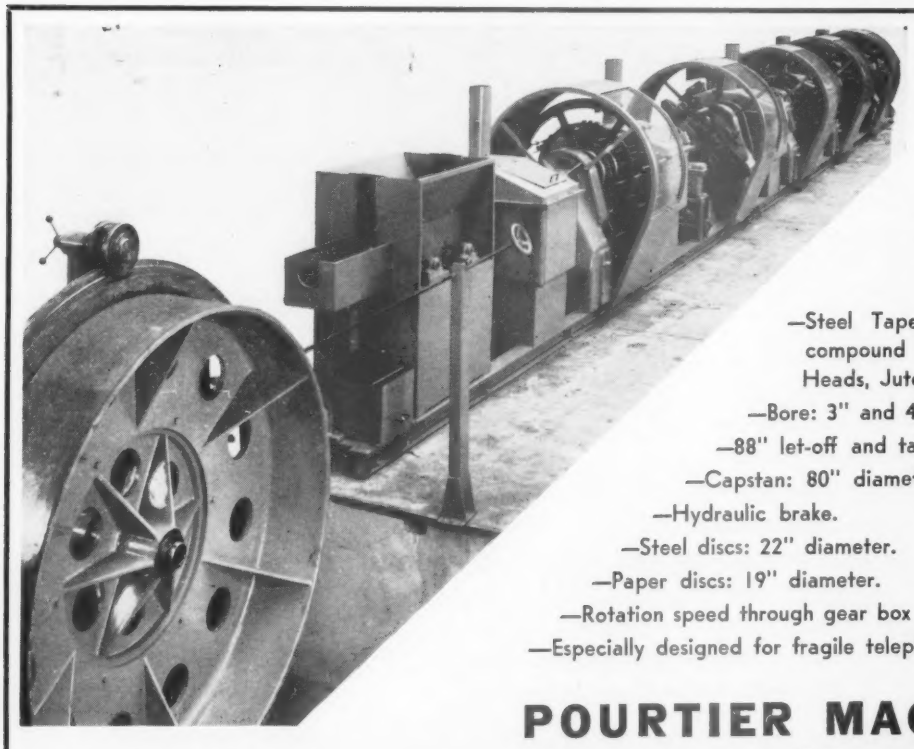
No. 2,789,289, SHAMPOO CAPE SUPPORTING FRAME, patented April 23, 1957 by Norma Jean D. Stevens and Rebecca Alica Dye, Chillicothe, Ohio.

A supporting frame adapted to be positioned over the shoulders of a person in supporting a beautician's cape, is disclosed and consists of wire.

★ ★ ★

No. 2,789,495, WIRE FORMING AND FEEDING APPARATUS FOR WIRE TYING MACHINES AND THE LIKE, patented April 23, 1957 by Thomas R. Sykes, Toronto, Ontario, Canada, assignor to The Toronto Star Limited, Toronto, Canada.

Round wire is fed from a supply and a requisite length thereof is flattened for fastening the ends together.



THERE IS ROOM IN YOUR PLANT FOR OUR

ARMOURING MACHINE

—Steel Tape Head, electrically heated compound Tanks, Powder Tank, Paper Heads, Jute Heads.
—Bore: 3" and 4½".
—88" let-off and take-up reels.
—Capstan: 80" diameter.
—Hydraulic brake.
—Steel discs: 22" diameter.
—Paper discs: 19" diameter.
—Rotation speed through gear box up to 240 r.p.m.
—Especially designed for fragile telephonic cables.

POURTIER MACHINES

153, rue Général Galliéni

ROMAINVILLE (Seine) FRANCE

No. 2,789,585, CUT-OFF MECHANISM FOR ZIG ZAG WIRE, patented April 23, 1957 by Albert M. Bank, Jersey City, and Alex J. Katz, West Orange, N. J., assignors to Super Sagless Spring Company, Jersey City, N. J., a partnership.

This patent is based on patent 2,676,-621 dated April 27, 1954 and discloses means for cutting off predetermined indexed lengths automatically and at high speed. The patent includes eleven claims and thirty-nine drawings.

★ ★ ★

No. 2,789,777, COIL CRADLE, patented April 23, 1957 by Pierre de la Motte, Nutley, N. J., assignor to U. S. Tool Company, Inc., Ampere, N. J., a corporation of New Jersey.

Included are motor-driven circumferentially-spaced coil rest rolls, as well as shiftable take-out rolls also operated by the same motor.

★ ★ ★

No. 2,789,778, WIRE DISPENSER, patented April 23, 1957 by Alvin A. Zogg and William E. Stephens, Houston, Tex.

This device is for simultaneously stringing multi-strand wire fence.

★ ★ ★

No. 2,789,926, PROCESS OF INSULATING WIRE WITH POLYTETRAFLUOROETHYLENE, patented April 23, 1957 by Robert W. Finholt, Erie, and William J. Wunch, Wesleyville, Pa., assignors to General Electric Company, a corporation of New York.

There are thirteen claims to this patent to a process for applying to a wire a tough flexible coating of solid tetrafluoroethylene polymer insulation by means of grooved calender rollers, and comprises polishing the wire to be coated, maintaining the wire polymer and rollers to a temperature of approximately 75° F., passing the wire to be coated downwardly between the grooved rollers having their grooves machine ground to a predetermined roughness, removing static electricity from the polymer in the form of a powder, conveying the polymer to the rollers, and heating the coated wire as it leaves the rollers to a temperature above 327° C. to fuse the ploymer into a tough flexible coating.

★ ★ ★

No. 2,790,299, METHOD AND APPARATUS FOR TWISTING WIRES, patented April 30, 1957 by Randall Gillis, Eggertsville, Elbert W. Larson, Williamsville, and Ralph M. Stine, Kenmore, N. Y., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

An apparatus for producing groups of alternate direction twists in longitudinally advancing initially parallel wires connected at spaced positions by insulating material is patented, the apparatus comprising a hollow guide for the wires mounted for rotation and including a fixed position jaw, a movable jaw and a device to urge the movable jaw toward the fixed jaw. The guide is rotated alternately in reverse directions to form alternate direction twists in the wires.

★ ★ ★

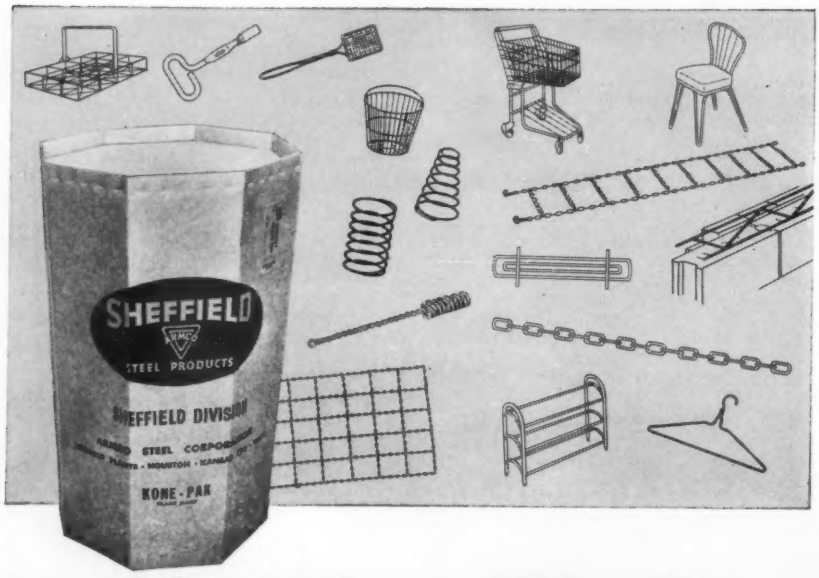
No. 2,790,488, SPRING CONSTRUCTION, patented April 30, 1957 by Hyland C. Flint, Birmingham, Mich., assignor to American Metal Products Company, Detroit, Mich., a corporation of Michigan.

A spring cushion construction is disclosed having longitudinally-extending transversely-spaced sinuous wire springs comprising straight longitudinally spaced sections joined alternately at opposite ends by reverse bent sections and having load receiving webs defining a resilient surface. There is also a border wire around the resilient surface having portions secured to the opposite ends of the webs, the border wire having a portion spaced transversely outwardly from a marginal sinuous spring, and a brace wire fixedly secured to a number of straight sections on the web so as to constitute a rigid extension of the straight sections.

★ ★ ★

No. 2,790,607, METHOD OF AND APPARATUS FOR WINDING CONDENSERS, patented April 30, 1957 by Dale R. Clemons, Riverside, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

An apparatus for winding condensers is disclosed and comprises a pair of rotatable heads mounted in axial alignment, a device for rotating the heads in unison, a supply reel for supplying an arbor filament mounted on one of the heads, and a clamp mounted on the heads for clamping the filament.



Let us help untangle your WIRE problems...

We're old hands at it. If you use manufacturers' wire, you may have a lot to gain by getting in touch with your nearby Sheffield office. Our metallurgists and wire specialists can analyze your wire uses and make recommendations that may speed production, improve products and cut costs for you.

Sheffield's steelmaking and wire drawing facilities enable us to supply the right wire for any set of specifications. We're doing it for manufacturers and fabricators of more than 2000 different products. We'll not only come up with the right wire for you, but we are often able to recommend more economical ordering units.

Finally, there's Sheffield packaging. Our Kone-Pak* gives you in one continuous spool the equivalent of 2 to 40 ordinary coils. Kone-Pak saves handling and machine downtime for loading. With it comes the protection of specially treated wrapping that assures rust-free delivery and storage of your wire.

Just call your nearest Sheffield office.

Pat. Pending

SHEFFIELD
ARMCO
Wire Products

Sheffield serves the Midwest, Southwest and Gulf Coast with one of the most diversified lines of finished and semi-finished steel products in the steelmaking industry.

SHEFFIELD DIVISION ARMCO STEEL CORPORATION
SHEFFIELD PLANTS: HOUSTON • KANSAS CITY • TULSA — OFFICES IN PRINCIPAL CITIES

Booklet on Nickel Alloy Wire

A 6-page handbook, "How To Design With Nickel Alloy Wire," is available without charge from **Techalloy Company, Inc.**, Rahns, Pa.

★ ★ ★

Publication covers designing with alloy wire such as Monel, Nickel, Inconel, Inconel "X," Stainless and Heat-resisting Steels. It takes actual situations and shows how successful answers were worked out to solve corrosion and heat-resisting problems.

★ ★ ★

Along with case studies, "How To Design With Nickel Alloy Wire" contains a guide for selection of materials and their use in product design and manufacture. Handbook is valuable reference and technical information for design engineers, production men and purchasing agents.

New "Escapement Type" Universal Spring Coilers Give Higher Production Speeds and Feed Accuracy

Based on the new escapement principle, the latest universal spring coiling machines by **Sleeper & Hartley, Inc.**, Worcester, Mass., are specifically designed for accurate high speed production of springs. These machines have been developed under the supervision of **Elmer W. Halvorsen,** Chief Engineer for the company, and include proven principles originated by Sleeper & Hartley, inventor of the universal spring coiling machines.

Elmer W. Halvorsen

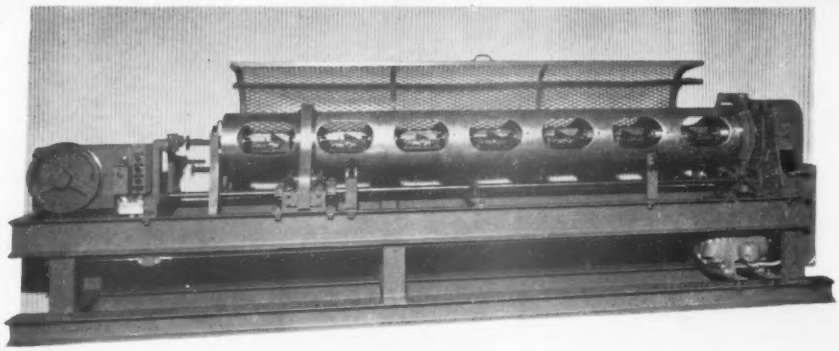
★ ★ ★

New accuracy and scope of the feed range is an outstanding feature of these machines. For accuracy of measurement, the feed is determined by cams which raise and lower the feed rolls. Previous to now, however, the feed from such a mechanism was limited to one revolution of the feed rolls.

★ ★ ★

The longer, more accurately measured feeds are made possible by an entirely new holding action which allows more than one revolution of the feed roll per spring. It combines a wider feed range capacity than that of the clutch and segment type machines with the high speed accuracy of the cam-operated feed roll action. An especially important and unique re-

SEVEN BAY HI-SPEED STRANDER



MODEL 7B55

DESIGNED AND MANUFACTURED FOR ARMY SIGNAL CORPS
WD-1/TT FIELD WIRE EQUIPMENT PROGRAM

Introduced in 1951, this strander has received wide acceptance and users report continuous superior performance. We are proud of this product! A departure from 50 years of steel barrel construction to utilize one of the latest high strength aluminum alloys has eliminated useless weight, increased speed, and reduction in operating cost. These stranders are available in 6, 7, 12 or 18 bay construction.

FOR COMPLETE INFORMATION WRITE TO . . .

BARTELL

BARTELL MACHINE-TOOL CORP.
ROME, NEW YORK

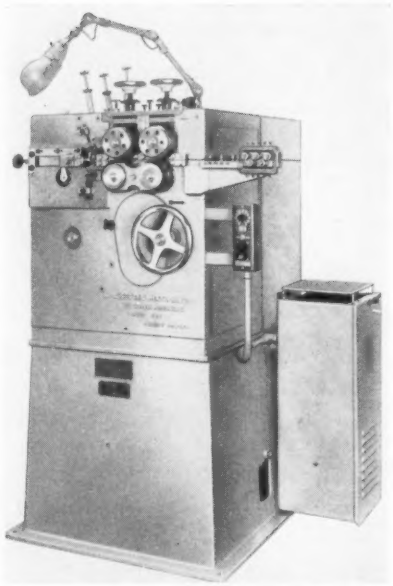
sult is that the wire feed does **not** vary with increase in speed. Feed ranges beyond the standard limitations are accomplished by a feed cycling arrangement combined with continuous coiling and manual cutter control.

★ ★ ★

In the new escapement type feed, nothing starts and stops except the wire itself, since the design eliminates all stopping, starting, and reciprocating motions in the feed mechanism. This reduces inertia to a minimum, and is a basic reason for the increased spring production of the new machines.

★ ★ ★

Camming of the springs is accomplished through new linkages designed for precision movement of coiling points and pitch tools. The lateral position of the cutter tool is rigidly maintained by the three-point suspension lock of the adjusting lever. Spring production is readily regulated by the Reliance AC-DC drive, with dialed speeds and push-button start, stop and jog control.



No. 1 Universal Spring Coiler
Escapement Type
Series 721
145" Model

★ ★ ★

The significance of the new advantages will be of particular interest to the production-minded spring manufacturer. Details of performance and engineering data are available from Sleeper & Hartley, Inc., Worcester, Mass.

TO SELL—ADVERTISE IN
WIRE AND WIRE PRODUCTS
It pays—send for rates
453 Main St., Stamford, Conn.

Macwhyte Increases Wire Drawing Capacity

Especially for and used only for **Macwhyte** Wire Rope, a battery of wire drawing machines has recently been added to Macwhyte's Wire Mill at Kenosha, Wis.

★ ★ ★

To meet the increasing demand for high quality as well as high strength Macwhyte Wire Ropes, Macwhyte ordered **Morgan** machines custom-made especially for wire used for Macwhyte's Rope

NORBIDE Abrasive Grain...
cuts die Refinishing Costs!

If you are still using costly diamond dust for refinishing your wire drawing dies, you'll be amazed at the savings you can make by switching to NORBIDE Abrasive. Wire mills everywhere have found that this abrasive—the hardest manufactured abrasive commercially available—is ideal for ripping and semi-finishing operations.

NORTON®
BORON CARBIDE
Making better products... to make your products better
NORTON COMPANY
45 New Bond Street, Worcester 6, Mass.

Many of our customers order NORBIDE Grain in 100 lb. drums. Many others order and re-order ¼ lb. and ½ lb. cans. No matter what your requirements are we can fill your order promptly from stock.

For details and prices on this cost-cutting abrasive write for Form 559.

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives Sharpening Stones • Behr-cat Tapes.

NORBIDE® | *The hardest manufactured abrasive commercially available!*

Mill. Machines were a year in the making and are the most modern 7-draft and 8-draft equipment.

★ ★ ★

The new Morgan wire drawing machines complement and increase the Macwhyte Wire Mill capacity of high quality, high strength wire to meet the requirements of Macwhyte Wire Rope for today's high speed, high output equipment.

★ ★ ★

High quality has always been foremost in the production of Macwhyte Wire Rope and for this reason special custom-made equipment is used by Macwhyte in the drawing of the many sizes of special wire used in 1/32" to 3⅛" diameter wire ropes.

New Plant for Waterbury Farrel to be Built

A. D. Mitchell, President of **The Waterbury Farrel Foundry & Machine Co.,** has announced that plans have been completed for the construction of the first unit of the Company's new plant on West Johnson Ave., Cheshire, Conn.

★ ★ ★

The building will be a machine shop and assembly bay, 675 feet long, with approximately 50,000 square feet of floor space. The cost, including site improvements and machinery and equipment, will be approximately $2,500,000. The schedule calls for the breaking of ground on or about April 1 and for completion of the building by the end of December, 1957. The plant, when operating, will require approximately 100 employees.

Buys Insulated Wire Firm

Olin Mathieson Chemical Corp. has completed negotiations for purchase of the assets of **Southern Electrical Corp.,** Chattanooga, Tenn., manufacturers of aluminum wire and cable. The announcement was made by **John M. Olin,** chairman of the board of Olin Mathieson, and **Thomas S. Nichols,** president. The purchase is subject to the approval of Southern Electrical stockholders.

The company's annual sales volume is approximately $15,000,000.

★ ★ ★

Southern Electrical will be operated as a part of Olin Mathieson's Aluminum Division. **Walter F. O'Connell,** executive vice president of the Aluminum Division, pointed out that a major construction program was begun last year to make Olin Mathieson one of the nation's four major producers in the aluminum industry. He also stated that there would be no changes in personnel or in distribution, manufacturing or sales policies.

Wire Reinforcement Institute to Meet

Frank B. Brown, Managing Director of the **Wire Reinforcement Institute,** Washington, D. C., has announced that a meeting of the Institute will be held on June 24 and 25, 1957, at the Greenbrier in White Sulphur Springs, West Virginia.

PLYMKRAFT

CABLE FILLER

Made to Your Most Exacting Specifications

Plymkraft Cable Fillers are made to fit your particular standard of manufacturing. Whether it is treated with wax, jute saturant or anthracene, Plymkraft is made to meet your moisture requirements in cables. Always uniform, made to a fine tolerance, and ready to use, Plymkraft Cable Fillers are ideal for highspeed cablers where extra strength is a must. Plymkraft's fill capacity means savings in a good-looking cable.

To keep up to date with cable filler developments, it takes only an inquiry for samples of Plymkraft. To find the quality cable filler best suited for your wire needs, write today to:

PLYMOUTH CORDAGE COMPANY

Plymouth, Massachusetts • New Orleans, Louisiana

Warwick, Virginia

Corrosive Fume Removal Described

The importance and use of "Corrosive Fume Ventilation Equipment" is described in a 10-page report released by **Heil Process Equipment Corp.**, manufacturer of chemical proof equipment.

★ ★ ★

Prepared and written by **Fred W. Arndt,** Heil's chief engineer, the report illustrates and covers recommended exhaust rates, procedures, air flow charts, types of systems and the different types of fume removal equipment and their applications.

★ ★ ★

For your copy of this report, write Heil Process Equipment Corporation, Dept. WWP, 12901 Elmwood Ave., Cleveland 11, Ohio.

New Color Concentrates for Polyethylene

The Claremont Pigment Dispersion Corp., 39 Powerhouse Rd., Roslyn Heights, L. I., N. Y., has issued a 6-page technical data bulletin, No. 220, on a new line of products developed by them.

★ ★ ★

This is designated as the "PE" Series of Granular Color Concentrates, that are especially intended for the coloring of polyethylene resins. Complete information, including tables of properties, is given, the bulletin being available upon request to Claremont's Dept. WWP.

New Wire Reel Positioner Announced

Designed especially to handle reels, the American Safeway Reel Positioner embodies all the features of larger, pedal-operated lift-trucks, yet eliminates unnecessary lifting height and excess weight.

★ ★ ★

The unit consists of a pedal-operated hydraulic lifting mechanism mounted on a steel frame equipped with two fixed wheels and two swivel casters. The truck has a foot brake and a locking device for holding the reel in a raised position for prolonged periods of time. May be moved about a plant.

★ ★ ★

A large number of these reel positioners were recently put into service in a large Eastern electrical equipment manufacturing plant for handling 500 pound reels of copper wire.

★ ★ ★

For full information, please write the manufacturer, **The American Pulley Co.,** 4200 Wissahickon Ave., Philadelphia 29, Pa.

Bulletin on Diamond Powders

A bulletin describing and pricing diamond compounds is offered by **The Amplex Corp.,** 968 Farmington Ave., West Hartford, Conn., manufacturers and distributors of industrial diamond products.

★ ★ ★

Listed are grades with micron range from ½ to 170-230 mesh (National Bureau of Standards Grades), in a variety of concentrations, color-coded to avoid error.

Another Development ...by Hubbard!

PLYWOOD MARRIES STEEL

FOR BETTER SHOP REELS

RESULTING IN

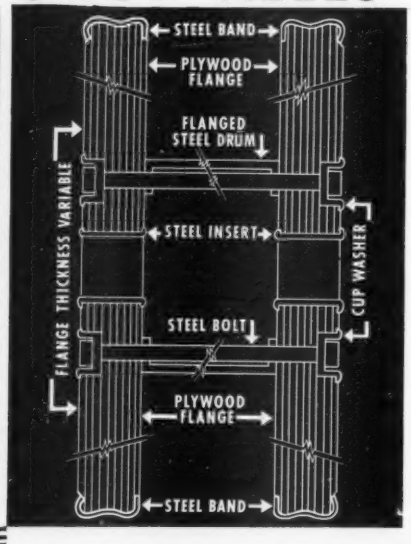
1 GREATER IMPACT STRENGTH

2 LOWER MAINTENANCE COSTS

3 LIGHTER WEIGHT FOR EASIER HANDLING

4 CAN BE SUBMERGED IN WATER

5 WIDE RANGE OF SIZES



LOWER INITIAL COST

FOR DETAILS CONTACT

HUBBARD SPOOL CO.

GARRETT, INDIANA

Six *advantages*
from just
One *dip!*

coat with
BORAX 5 MOL.

Here are the advantages you get when your stock is Borax-coated...

1. GOOD ACID NEUTRALIZING
2. LONGER DIE LIFE
3. FASTER BUTT WELDING
4. BETTER WORKING CONDITIONS
5. LONGER STORAGE WITH SAFETY
6. RUST DOES NOT FORM

One dip puts on a Borax coat that is tight, yet pliable, and dries in a few minutes. It provides a good vehicle for your drawing lubricant and won't flake off. Borax-coated rods are a lot cleaner to handle in transit and are protected from rust while in storage. Try BORAX or BORAX 5 MOL on *your* stock!

Write to our Technical Department for further information

United States
Borax & Chemical
Corporation

PACIFIC COAST BORAX COMPANY DIVISION

100 Park Avenue, New York 17, N.Y.
630 Shatto Place, Los Angeles 5, Calif.

Los Angeles · Chicago · Philadelphia
New York · Kansas City · Cleveland

Of interest to finishers of wire drawing dies is Amplex "WC" Pure Diamond Compound, especially developed for machine lapping and small hole finishing of tungsten carbide dies and tools. Carefully graded diamond is suspended in a special non-gumming vehicle which stays with the lap. "WC" compound is offered in 5 gram jars, heavy concentration only.

★ ★ ★

Also listed is an all-purpose diamond compound used for obtaining fine finishes on steel and carbide tools, drawing dies, striking dies, heading dies, gages, metallographic specimens, plastic molds, precious metal rolls, sapphire, ceramics and a variety of component parts.

★ ★ ★

This compound is available in 5 and 18 gram cartridges to fit standard applicators and in 5 gram collapsible metal tubes.

New "Chemical Formulary" Published

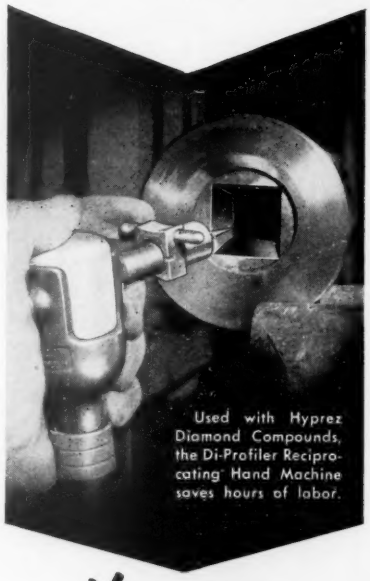
The Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y., has just published Volume 10 of The Chemical Formulary. This tenth volume of a successful and popular series, compiled by a staff of experts and edited by H. Bennett, contains 384 pages packed with useful information.

★ ★ ★

It contains hundreds of new formulas, adhesives, cosmetics and drugs, emulsions and other colloids, farm and garden specialties, food products, inks and marking compounds, insecticides, fungicides and weed killers, leather, lubricants and oils, materials of construction, metals and their treatment, paint, varnish and lacquer, paper, photography, polishes, pyrotechnics and explosives, rubber, resins, plastics and waxes, soaps and detergents, textiles as well as numerous miscellaneous products.

★ ★ ★

Volume 10—as its predecessors—counts numerous well-known experts among its contributors. It does not duplicate any of the



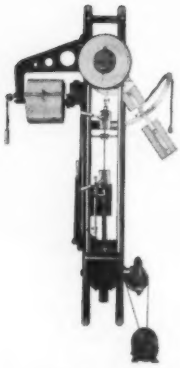
You can save money, muscle, and finishing time with
THE **Di-Profiler**
FLEXIBLE SHAFT
RECIPROCATING HAND MACHINE

For grinding, filing, scraping, honing, lapping, polishing—the Di-Profiler saves hours of tedious hand labor. The speed of reciprocation can be varied from 0 to 100 strokes per second; the length of stroke is adjustable from 0 to ¼ inch.

Ask for a Free Demonstration or Technical Bulletin No. DW-67.

HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. Dearborn Street, Chicago 5, Illinois

"Picturized" testing determines suitability



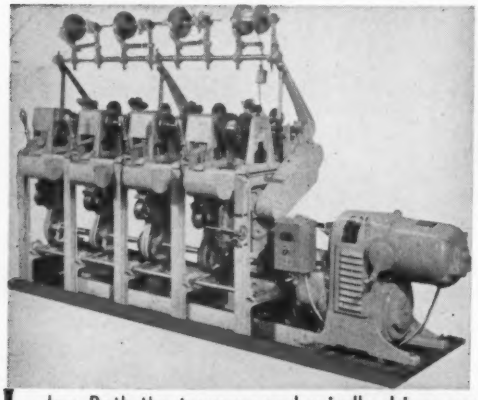
Scott Tester* Model J-5 is world standard for the evaluation of wire up to 2,000 lbs. in accordance with established Specifications. Determination of suitabilities for purpose is readily accomplished by non-technical personnel.

State Your Testing Problem and let our 58 years experience assist.

* Trademark

SCOTT TESTERS, INC. 55 Blackstone St. Providence, R. I.

Scott Testers — Standard of the World



1900-HV MULTIPLE SPINDLE SPOOLER

SPECIFICATIONS
Size Range: .010" to .080" or heavier if soft and many flat wire sizes.
Max. Spool Size: 16" flange diameter.
Capacity: usually 4 to 8 spindles.

The 1900-HV Spooler is a rigid, precision machine which will consistently produce a uniform, dense wire lay. Both the traverse and spindle drives are regulated through wide-range, stepless, variable speed units, eliminating change gears. The 1900-HV is completely adaptable to your particular constant or changing demands. All controls are positive. Adjustments are made accurately with the spooler in operation and without tools.

Both smooth acceleration and rapid stopping is obtained through a single lever at each station. Spool changing is simple and rapid. Anti-friction bearings are used on all shafting and spindles.

Your special requirements can be incorporated into the design. Each machine is delivered ready for operation from your power supply. Payoff stands furnished as extras.

Consult us on your spooling problems.

ROBERT J. EMORY COMPANY
31 East Runyon Street Newark 5, N. J.

formulas included in the previous volumes, but lists a wide array of modern and salable products from every branch of the chemical industries. It is a treasury of information for the chemist and businessmen.

Porter Acquires Federal Wire & Cable

H. K. Porter Company, Inc. has purchased the **Federal Wire & Cable Co., Ltd.**, Guelph, Ontario, according to an announcement by **T. M. Evans**, Porter's Chairman. Acquisition of Canada's fourth largest wire and cable concern was made by **H. K. Porter Co. (Canada) Ltd.**, a wholly-owned Porter subsidiary.

★ ★ ★

Federal's products include cable for the aluminum, aircraft, automotive and electrical industries. Wire is manufactured for the appliance, building, radio and telephonic industries. Among other products are automotive and special harness assemblies to customer requirements.

★ ★ ★

Harold F. Nunn, Vice President and General Manager of Porter's Canadian organization, will move his headquarters from Toronto to Guelph to supervise the new operation. **J. Godfrey Smith,** founder and president of Federal, will retire but will be available to the new Porter division for consultation. His son, **Thomas G. Smith,** has been named Federal's General Sales Manager. He has been head of western sales for Federal and assistant to the general manager for several years. He formerly was with Canadian General Electric.

Seymour Absorbs Subsidiary

The Seymour Manufacturing Company, Seymour, Conn., has absorbed its former subsidiary, **The Phosphor Bronze Corp.,** but will continue to manufacture "Elephant Brand" phosphor bronze in its integrated mills here. Other Seymour products are nickel silver and brass alloys.

Literature on Wire Marking

Gem Gravure Co., School St., West Hanover, Mass., has issued a series of bulletins on its products for printing on electric wire and cable. These bulletins cover the following:

Type SM Marking Machines for use on C.V.'s plastic extruder, regular insulators and coilers. This machine will print at speeds up to 1800 ft./min. with no ink splatter, on hot, cold or wet wire.
Type CV Machine for marking or embossing wire, tubing, pipe or webbing, marks on all materials, hot or cold.
Type DM Machine for printing single or double stripes at the extruder, operates up to 1800 ft./min. Prints on all jacketing materials.
Marking wheels of hardened tool steel—concave, flat, embossing, etc. wheels for every marking purpose.
Inks for marking for printing hot or cold on PVC's, polyethylene, natural and synthetic rubber, etc.
Table of recommended type sizes for different diameters of insulated wire, single or twin.

★ ★ ★

Copies of these bulletins will be sent upon request to the company.

Folder on Rod Diameter Control

A new pamphlet covering the subject of non-contract control and measurement of hot rod diameters for wire rod and other hot rolled shapes is announced by **Industrial Gauges Corporation,** West Englewood, N. J. These gauges and controls are actuated by the infra-rays emitted from the hot metal as it leaves the rollers. It detects all possible diameter variations and automatically adjusts rollers accordingly.

★ ★ ★

For your copy, please write to the company.

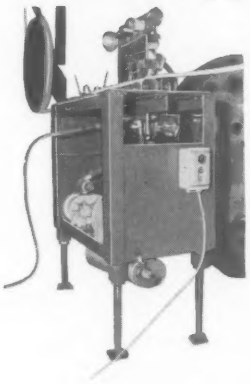
Report on Diamond Dies

The Technical Committee of the **British Diamond Die Federation,** Dickens House, 15 Took's Court, London E.C.4, has been making comprehensive tests on British, Continental and American diamond dies over a number of years.

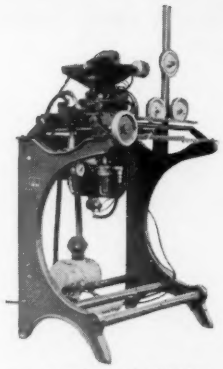
★ ★ ★

The results have been embodied in a report that will be made available to the public at a nominal

LABELING MACHINES for WIRE and CABLE



SE-300 SERVICE ENTRANCE LABELING MACHINE.
Designed for labeling Service Entrance Cable. Will apply a UL label every 20 feet. Fully automatic. Speed limited only by the speed of the wire.



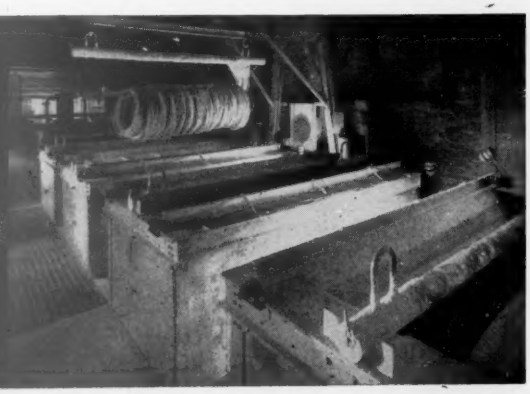
FA-200 FLAG LABELER.
This machine has high operating efficiency—up to 3000 labels per hour. Used before an Artos Cutter, with speed governed by cutter. Completely automatic. Space available on labels for advertising.

Write today for detailed information.

DEWYER, INC.

P.O. BOX 208
LIBERTYVILLE, ILLINOIS
Telephone: LI 2-2161

carl mayer
HI-SPEED REGISTERED
ROD BAKERS



Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

Here are just a few of our many satisfied customers:

American Steel & Wire Co.
Atlas Steel Co.
Colorado Fuel & Iron Corp.
Crucible Steel Co. of America
Driver-Harris Co.
B. Greening Wire Co., Ltd.
Indiana Steel & Wire Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp.
Sheffield Steel Div., Armco Steel Corp.
Steel Company of Canada

Write for Bulletin No. 350

Patent Nos.
U. S. A. 2,296,361 2,323,828 2,235,559
Canada 396,144 401,589

THE carl mayer CORP.
3030 EUCLID AVE., CLEVELAND 15, OHIO
OTHER PRODUCTS: Core Ovens • Mold Ovens • Welding Rod Ovens • Heat Treating Ovens & Furnaces • Special Processing Equipment and Accessories.

DIAMOND POWDERS
ACCURATELY GRADED AND GUARANTEED

There Are Two KAY & WARREN Services:

1. *RECLAIMING*—Send us your diamond-bearing waste materials. We will clean, grade and return them to you—or, we will buy them on the basis of the amount of powder reclaimed. Your preference is our guide. Fair enough?

2. *VIRGIN AND RECLAIMED POWDER SALES*—A full range of micron sizes is maintained that we sell on a *money back guarantee.* All are graded as to size and quality.

Free samples are furnished for inspection and trial in sizes of 0-2, 1-5, 4-8, 6-10, 10-20, 20-40 and 30-60, plus 325 and 400 mesh.

Write or phone for information on our diamond powder services.

KAY & WARREN CO.

33 BOX STREET • BROOKLYN 22, N. Y.

Telephone: EVergreen 3-5514 and 3-5560

A RUGGED, DEPENDABLE
Wire Measuring Machine
for fast, accurate runs!

Wire is easily "loaded" into measuring machine from the side or the rear without having to feed through guide bushings. Brake stops measuring wheel instantly when wire leaves measuring rolls. Predetermined units will automatically stop wire at desired length. Very accurate speeds to 2500 ft. per minute.

MODEL "L-25"
Capacity .030 to 1 in. Tachometer to govern rate of speed is optional.

DURANT
MANUFACTURING CO.

1918 N. Buffum St.
Milwaukee 1, Wis.
18 Thurbers Ave.
Providence 5, R. I.

Send for Catalog No. 40

Representatives in Principal Cities

PRODUCTIMETERS
SINCE 1879 *Count Everything*

charge if sufficient demand for it develops.

★ ★ ★

Those who would like to have copies of the report should register their interest by writing the British Diamond Die Federation.

Rome Cable to Construct New Research Center

A. D. Ross Fraser, president, **Rome Cable Corp.,** has announced that work was started in April on a new $500,000 research center at the company's main plant in Rome, N. Y.

★ ★ ★

The new center, a 121-foot square building with a total floor area of 25,600 feet, is expected to be completed by November. Approximately 50 employees will man the three-story glass and brick structure under the direction of **Rudolph Schatzel,** Vice President and Director of Research.

★ ★ ★

The research center will feature a complete pilot plant so that experimental production runs can be made without interrupting the normal production activities within the plant. An outdoor area for "weather testing" cables will be included also.

★ ★ ★

Mr. Fraser said that the new center will enable Rome Cable to do a more complete job of fundamental research, working more closely with independent outside research groups and incorporate their findings into our own research and manufacturing operations.

Book of Technical Data on Plastics

The Manufacturing Chemists' Association, Inc. has published a new book covering the plastic materials produced by member companies. It is especially compiled for engineers and designers, containing more than 200 pages of data in the properties that characterize the many commercially available plastics. Each plastic of like base materials are sub-divided into types, each of which is treated in a section or chapter.

The book sells for $3.25 per copy and may be ordered from the Manufacturing Chemists' Association, 1625 Eye St., N. W., Washington 6, D. C.

New Speed Measuring Device

A new bulletin has been published by the **Boulin Instrument Corp.,** 10 First St., Pelham, N. Y., describing an instrument for measuring rotational and vibrating motion.

★ ★ ★

Called the "Visutac", the device is accurate, versatile, portable and low in cost. It is available in two models for measuring speeds respectively of 500 to 8000 and 1000 to 16,000 RPMs on VPMs. Using no electric current, it is not subject to errors due to power fluctuation.

★ ★ ★

Write to the company asking for the bulletin on the Visutac.

Reprint of Article on Use of Carbide Dies for Bolt Making

A. E. Glen, Manager—Die Sales, **Metallurgical Products Dept., General Electric Co.,** Detroit, has announced the availability of an article reprint entitled "Carbide Dies Last Longer in Fastener Upsetting."

★ ★ ★

In it is described the experience of a titanium aircraft bolt maker, who, through the use of cemented carbide in steel alloy bolt heading, has increased production roughly 16 times — or from 150 to 2500 bolts per hour. Dies used previously wore out after 3000 impressions, whereas the Carboloy 190 grade dies produced 50,000 before showing signs of wear on the larger sizes of bolts.

★ ★ ★

Write to the company, Box 237, Roosevelt Park P.O., Detroit 32, Mich., for a copy.

Expands Michigan Wire Plant

National - Standard Company's plant at Niles will have more than 400,000 square feet of manufacturing space with the completion by

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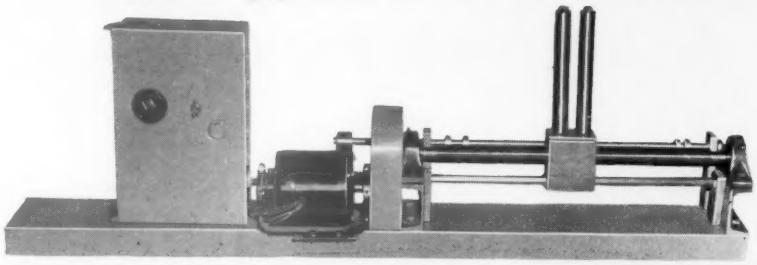

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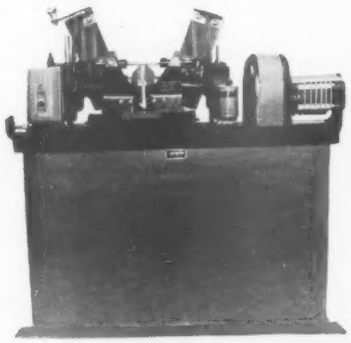

Many of our machines have been in service up to 10 years. Our later MODEL "526" (pictured), with a capacity of 5/16" to 6", is now the accepted leader in the scrap and salvage trade. Strips short or long lengths, or off the reel.

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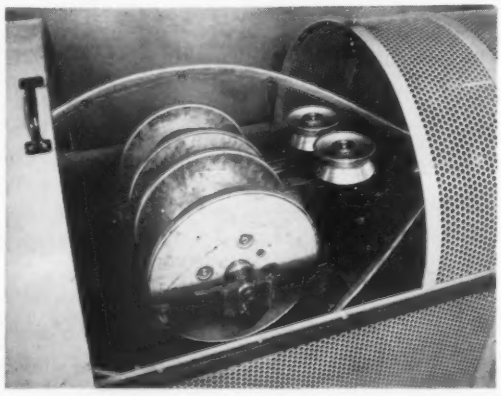

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Speeds up to 2280 lays per minute.

Reel sizes up to 24 inches diameter and 9¼ inches overall width or 19 inches diameter and 13½ inches overall width.

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July 1 of a new 16,000 square foot addition. A one-story steel frame structure joined to the existing buildings, the addition will have a 100-foot clear span and be 160 feet long.

★ ★ ★

National - Standard, a leading manufacturer of tire bead wire, high carbon flat steel, wire cloth, special machinery and a variety of fine wires, has plants in six states, Canada and England.

Improved Straightener and Cutter Announced

News to users of wire straightening and cutting machines is the announcement by **Mettler Machine Tool, Inc.,** 132 Lawrence St., New Haven 11, Conn., that its Shuster 3AV and 4AV machines are now completely electrified. The 3AV, with a capacity of from ¼" to ½" basic wire, and its big brother the 4AV, from ⅜" to 11/16", each include as original equipment two Reeves Variable Speed Transmissions, controlling infinite speed of feed and speed of cut; Mirco-Switch target, electrically activating the roll-type clutch and automatic cut-off; solenoid clutch control; and Warner Electric Brake on clutch shaft. The 3AV feeds up to 220 feet per minute, and the 4AV has a feed range of from 90 to 180 feet per minute.

Auto-Lite Appoints Wire and Cable Executive

Appointment of **Charles E. Richey** as his staff assistant has been announced by **R. E. Valk,** Electric Auto-Lite Vice President and Group Executive in Charge of the Wire and Cable and Foundry Divisions.

★ ★ ★

In his new post Mr. Richey will work on special assignment in areas of management research and administration research as well as assist in divisional control. The Wire and Cable Division has plants in Port Huron, Michigan, and Hazleton, Pa., and the the Foundry Division has plants in Toledo and

Fostoria, Ohio, and Mt. Vernon, Ill.

★ ★ ★

Prior to this appointment, Mr. Richey, an engineer, was on the staff of **J. A. Cappi,** Electric Auto-Lite Vice President and Manager of the Champlain Street and Ketcham Avenue Plants in Toledo. He first joined Auto-Lite in 1941 and since that time has worked on special assignment in all phases of management including industrial relations, production, methods and cost.

5000° F. Graphite Tube Furnace Bulletin

A new bulletin, "Harper Graphite Tube Furnaces for Temperatures to 5000° F.," has just been prepared by the **Harper Electric Furnace Corp.** of Buffalo, N. Y., manufacturer of high temperature furnaces and kilns for the metalworking and ceramic industries.

★ ★ ★

The illustrated bulletin mentions the operating limitations of graphite tubular element research and production furnaces and describes the auxiliary and control equipment normally used. It also includes a table of specifications and dimensions of 17 standard models now available.

★ ★ ★

Copies may be obtained by requesting Harper Bulletin CT-1156.

Elgin Issues Carbide Tool Guide

A new carbide tool catalog and metalworking guide is announced by the Abrasives Division of **Elgin National Watch Co.,** Elgin, Ill.

★ ★ ★

Containing information on the company's complete line of carbide rotary tools under the "Golden Circle" name, the booklet is available to the trade upon request.

★ ★ ★

Highlighted is information about Elgin's new line of "electroground" end mills, which are manufactured by a revolutionary electrolytic process.

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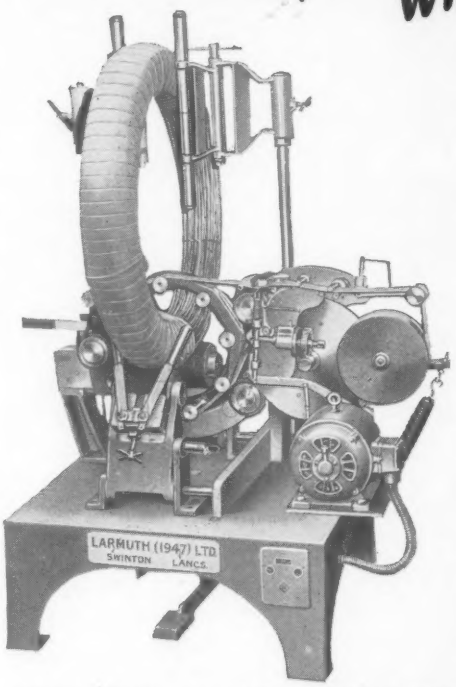

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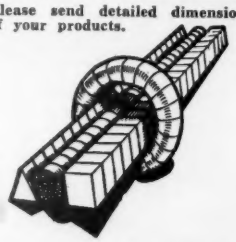

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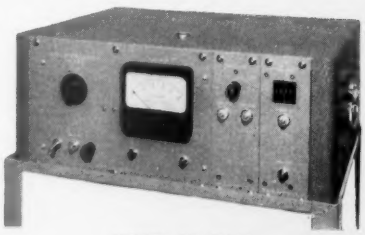

MODEL 10 CV-X
(Floor stands available also)

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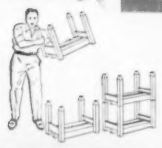

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MODULAR STORAGE SYSTEMS FOR METAL INDUSTRY • STEELMOBILE

Two pages of the publication are devoted to operating suggestions covering end mill, reamer drill and bur speeds, as well as data on recommended feeds when working with most metals, hard rubber and plastics.

Armco Catalog on Stainless Rod

Stainless steel bar and wire is the subject of a new 24-gage booklet from **Armco Steel Corporation.** It describes 45 types of stainless steel available in these forms, including several special proprietary grades. Advantages, properties, fabrication, electropolishing, ebonizing and supply information are also included. The booklet is well illustrated with typical applications. Copies are available from the company's Product Information Service, Middletown, Ohio. Ask for P.O. 4756.

Instructions for Metal Identification Tests

Procedures for a new one-minute identification test for Monel, Nickel and Stainless Steel types 302, 304, 316 and 317 are released by **Techalloy Company, Inc.,** Rahns, Pa.

★ ★ ★

Called the Moly Test, it uses an electrographic method to determine the metal. Moly Test does not require elaborate equipment, is easily set-up and gives positive and accurate results in one minute.

★ ★ ★

A procedure sheet details the Moly Test. Equipment needed is a 6 volt dry cell battery, aluminum strip, photographic blotting paper and spot reaction paper. Three solutions are used and their formulas are shown. Results which determine the metal tested are explained.

★ ★ ★

Complete instructions for Moly Test are available without cost from Techalloy Company, Inc.

Rome Cable Increases Use of Non-Returnable Wire Reels

To increase customer convenience and reduce its own in-plant costs, **Rome Cable Corp.,** Rome, New York, will expand its present program of wire and cable shipments on non-returnable reels to include larger sizes of building wire up to 500 MCM, according to officials of the company.

★ ★ ★

L. J. Kunkel, packaging manager, states that non-returnable reels have been designed for many of their wires and cables, including, in some instances, very small sizes of wires. Since Rome Cable began using 'one-way' reels in the middle of 1955, they have shipped approximately 50,000 reels to customers. Although the reels offer many advantages both to customers and the company, there is no increase in the prices of wire and cable shipped in this manner.

★ ★ ★

New reels with 32, 36, 42, and 48-inch flange diameters will be used to ship building wire types RHW, RH-RW, TW, RR, and RR-D. Triplex in larger sizes will also be shipped on non-returnable reels.

Universal Wire Enameling Equipment Announced by GE

A universal enameling oven, capable of operation on fuel gas or electric heat, has been announced by **General Electric's Industrial Heating Department.** Simultaneously, the department also announced development of a universal preannealer for continuous annealing of wire and strip materials.

★ ☆ ★

Designed for the continuous baking and curing of film-type insulating coatings on wire, the universal oven can be used to bake or dry coatings applied to metallic strip or wire and impregnated cloth-type material.

★ ★ ★

Designed for operation in conjunction with the universal oven, or for a separate annealing process, is a new continuous annealer unit. Easily adaptable to electric or gas heat sources by changing heat plugs, consistent with the physical

and chemical characteristics of the coating material, according to General Electric engineers.

★ ★ ★

Integration of the continuous annealer with the universal oven provides continuous combined annealing and enameling of most types of wire and strip materials, thus eliminating intermediate materials handling. The annealer can be operated in any plane, since it can be mounted horizontally or in positions from 0 to 60 degrees from the perpendicular.

Union Drawn Adds Fourth Carbon Correction Furnace

Republic Steel Corporation's Union Drawn Steel Division, a leader in carbon corrected annealed steels, is increasing its productive capacity for these products, **D. D. Buchanan,** manager of operations, announced in March.

★ ★ ★

The installation of a fourth continuous carbon correction annealing furnace at the Massillon plant will enable Union Drawn to give faster service on such steels to present customers and supply new customers whose orders could not be handled previously.

★ ★ ★

Designed to specifications drawn by Union Drawn's chief metallurgist, **J. D. Armour,** the furnace in one continuous operation both anneals steel bars and restores carbon to the surface of the bars burnt out by previous hot working operations.

★ ★ ★

Union Drawn metallurgists perfected carbon correction annealing processes in the early 1940s. This process makes it possible to eliminate grinding or machining operations and to save valuable steel formerly lost in these operations.

★ ★ ★

The installation of the new continuous furnace will increase annealing capacity at the Massillon plant sufficiently to enable the company to move one of the car-type furnaces to the division's East Hartford, Conn.

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WIRE WELDING MACHINES
„Strecker-Auteldra"
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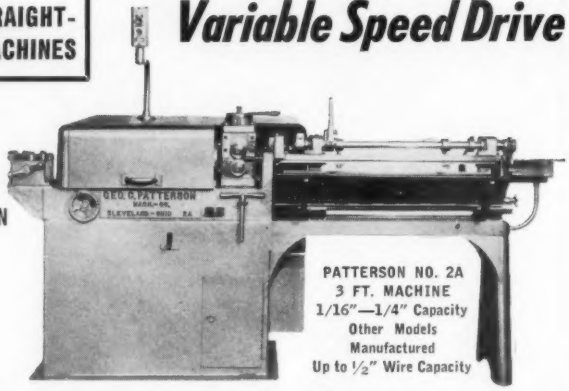

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Outstanding Personalities of the Wire Industry

(*Continued from page* 683)

Bakelite Promotes Bowditch

The appointment of **R. P. Bowditch** as Assistant General Product Manager is announced by **Dr. C. M. Blair,** Product General Manager—Polyolefins—of **Bakelite Company,** Division of Union Carbide and Carbon Corp. Mr. Bowditch will be located in Bakelite's Production and Development Center, Bound Brook, N. J., and will assist Dr. Blair in the co-ordination of the corporation's program in polyethylene and related products. Mr. Bowditch received his degree in Mechanical Engineering from the University of Illinois and joined Union Carbide Corporation in 1935 at South Charleston, West Virginia. He served in the Concentrates Raw Materials Department until 1943, following which he became Area Supervisor of Polyethylene Production and in 1952, an Assistant Director of the Gas Process, Engineering and Development Department.

Associated Spring Elects Officers

Owen D. Nee has been elected Treasurer and **Wallace Barnes** has been elected Secretary of **Associated Spring Corp.,** Bristol, Conn., according to an announcement by **Carlyle F. Barnes,** President.

* * *

Mr. Nee, who has been assistant secretary, succeeds **Alden C. Purrington,** first Vice-President and Treasurer. Mr. Barnes, who is a partner in the Bristol law firm of Beach, Calder & Barnes, succeeds **S. Russell Mink, Sr.** Messrs. Purrington and Mink are both retiring as officers, but will continue to serve as directors.

Asst. G.M. Named by Riverside-Alloy Metal

The appointment of **Julius C. Hydrick** as assistant general manager of **Riverside-Alloy Metal Div., H. K. Porter Company, Inc.** has been announced by **W. Harvey Thompson,** the division's vice president and general manager.

He had held the position of Works Manager at two other Porter divisions, Quaker Rubber and Delta-Star Electric. Before joining the Porter organization in June, 1950, he was with General Electric Company, Lynn River Works. He graduated from Louisiana State University as an Electrical Engineer.

New Head for Canada Wire

O. W. Titus, who has been vice president and general manager of **Canada Wire & Cable Company, Ltd.,** subsidiary of Noranda Mines, Ltd., was elected president of the company at a directors' meeting following the annual meeting. He succeeds **John R. Bradfield,** who resigned as president and becomes vice chairman of the board of directors. Mr. Titus is also president of the Canada Wire & Cable subsidiary, **Telecables & Wires, Ltd.**

Naugatuck Chemical Promotes Two

Two changes in the executive staff of the **Naugatuck Chemical Div., United States Rubber Co.,** have been announced by **George R. Vila,** newly elected vice president and general manager.

★ ★ ★

Earle S. Ebers, formerly general sales manager, has been appointed assistant general manager of the division, the post previously held by Mr. Vila. **Harold M. Parsekian,** who was assistant general sales manager, has been named general sales manager.

★ ★ ★

Mr. Ebers joined the rubber company in 1937 as a research chemist in its general laboratories. In 1946 he became plastics development manager for the chemical division. He was named sales manager for Kralastic and Vibrin resins in 1949, and four years later was appointed director of research and development for the division. In 1955 he was named general sales manager.

★ ★ ★

Mr. Parsekian joined the rubber company in 1949 when it purchased

Sjogren

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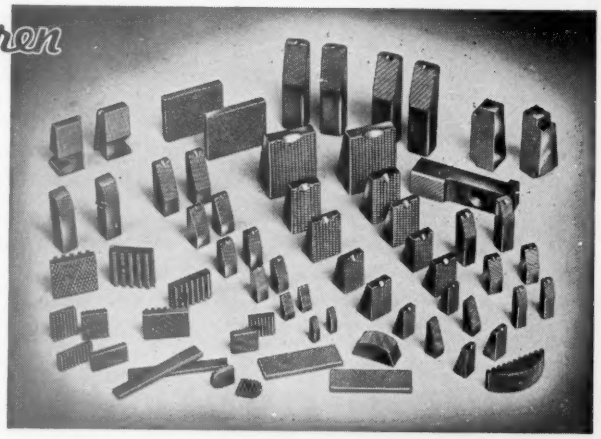

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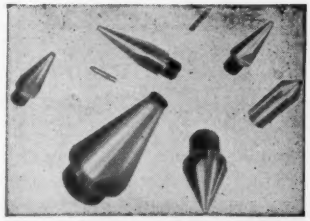

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the chemical division of Glenn L. Martin Co., where he was director of sales and technical service. His first post was manager of Marvinol resin sales. He became manager of plastics sales in 1953 and the following year was appointed assistant general sales manager.

Appointed General Manager of Torrington Manufacturing's Machine Division

Horace W. Whitman has been appointed General Manager of the Machine Division of **The Torrington Manufacturing Co.,** Torrington, Conn., producer of wire-forming machinery and rolling mills. Within the overall administration of **G. H. Froelich,** vice-president of the Division, Mr. Whitman will supervise sales, production, engineering and purchasing activities for the company's wire-forming and rolling mill products.

★ ★ ★

In his nine years with the Machine Division, he has been Superintendent of Manufacturing for four years and since January, 1955, Assistant General Manager. He is a graduate of Princeton University where he secured a degree in Mechanical Engineering. He was with Hamilton Standard Division of United Aircraft Corp. for several years before joining Torrington Manufacturing.

I.H.E.A. Elects Officers

Walter Holcroft, Executive Vice-President of the **Holcroft Company,** Detroit; has been elected President of the **Industrial Heating Equipment Assn.** at its annual meeting in Washington.

★ ★ ★

C. Floyd Olmstead, President of the **Lee Wilson Engineering Co.,** Cleveland, was named Vice-President, **Carl L. Ipsen,** was re-elected Executive Vice-President of I.H.E.A. and **Ralph E. Whittaker,** Secretary of the **Swindell-Dressler Corp.,** Pittsburgh, was re-elected Treasurer.

★ ★ ★

New members of the Board of Directors include: **A. E. Tarr,** As-

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"IT CORRECTS THE DIE"

automatic Polishing Machine

Double your finished Tungsten Carbide Die production

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THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

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sistant to the President, Leeds and Northrup Co., Philadelphia; **A. R. Robertson,** President, **Wayne Industrial Furnace Co.,** Detroit, and **R. L. Harper,** Executive Vice-President, **Harper Electric Furnace Corp.,** Buffalo.

The Wire Association Awards for 1956

(*Continued from page* 669)

Committee members who judged the 1956 papers were:

David M. Schmid, Pres. (Chairman)
Techalloy Co., Rahns, Pa.

William D. Bawden, Wks. Mgr.
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H. Clark Smith, Jr., Technical Director
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★ ★ ★

Those men whose papers were deemed worthy of awards in 1956 are to be congratulated for their excellent work, particularly as the Committee is under no obligation to recommend any awards, if, in their judgment, there have been no papers that warrant these honors.

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CF&I Prexy Receives Award

Alwin F. Franz, president of **The Colorado Fuel and Iron Corp.** is one of 11 prominent business men who received the 1957 Horatio Alger Award, it was announced by the Horatio Alger Awards Committee of the American Schools and Colleges Association, Inc.

★ ★ ★

The award is given each year to men whose careers best reflect "The enhancing of the American tradition of overcoming obstacles to achieve success through diligence, industry and perseverance." Mr. Franz rose from open hearth pitman to become president of the nation's ninth largest steel company.

☆ ★ ★

Presentation of the awards took place on May 9, 1957, at the Waldorf-Astoria. **Dr. Norman Vincent Peale,** national chairman of the Awards Committee, and **Brig. Gen. David Sarnoff,** 1951 award winner, made the presentations.

Titanium Wire Cloth in Production

Cambridge Wire Cloth Company, Cambridge, Md., is producing a corrosion resistant titanium wire cloth on a production basis. First used by the chemical processing industry, the new titanium product is finding applications in filtering assemblies, catalysts, screens and other equipment.

★ ★ ★

Medical research has shown interest in titanium wire cloth for prosthetic devices. In the pulp and paper industry, titanium is reported to be showing excellent resistance to hypochlorite and chlorine dioxide bleaches.

★ ★ ★

Successful weaving of wire cloth requires wire with good elongation and uniformity of temper. Said to be the purest and most ductible standard grade of titanium produced as a mill product, Rem-Cru's A-40 is virtually immune to attack in environments where other metals may fail.

Industry Leaders Address Annual Spring Meeting of NEMA'S Wire and Cable Section

(*Continued from page* 665)

"In the final analysis," he said, "the most important matter is the total cost-per-mile of fleet operation. While cost-per-mile can mean different things to different people, if all of the actual components are used in making up the cost per mile, it will be the ultimate criterion for judging the success of a fleet program."

Charges Exploitation of Unemployment Compensation Systems

Supplemental unemployment benefits were discussed as one of the closing subjects on the convention's program in a hard-hitting talk by Mr. Molthrop, who told his audience that "a vicious combination of politicians and labor bosses have worked continuously to exploit unemployment compensation state systems."

★ ★ ★

To support this contention, Mr. Molthrop quoted on labor leader who was purported to have said: 'We are going to work at providing the most powerful economic incentives that the Auto Industry ever had by building this GAW to 100 per cent—so that it will cost them just as much to keep us unemployed as it does to keep us fully employed. Then you watch how fast they find a job for us on a full time basis.' "

★ ★ ★

He also said "The AFL-CIO knows that experience rating under unemployment Compensation State Systems controls reduces the reserve funds in the states from which unemployment benefits are paid. If a single federal system could be established with greatly reduced standards and higher uniform benefit payments, an inevitable result would be an increase in the unemployment compensation tax rate which every employer would be required to pay.

★ ★ ★

"It is difficult to see how employees who are given the facts

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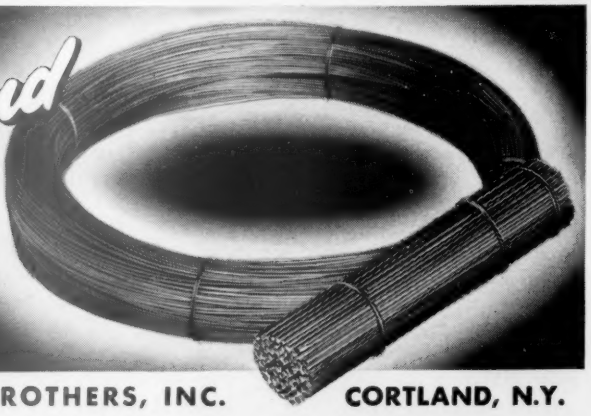
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could have any interest in supplemental unemployment benefits. On the average, only inexperienced, short service employees have any chance of deriving any benefits from such programs. The experienced, skilled, long service employees, the loyal family man in most instances, is rarely laid off and therefore gains nothing.

★ ★ ★

"Since these are the facts, it should be crystal clear that the avowed interest of the labor bosses is not in the interest of rank and file members of organized labor. The 'dagger in the cloak' should be exposed for what it is before inroads can be made which will wipe out experience rating and destroy the independent unemployment compensation state system."

Wire Production from Refractory Copper-Base Alloys

(*Continued from page 653*)

aces. From this stage, almost all annealing is done in atmosphere-controlled electric pusher furnaces.

★ ★ ★

The routine of reduction and annealing is continued until the final desired size and temper are achieved. Rod as thick as 4" in diameter and wire as thin as .005" are produced; and, in addition to regular round forms, special shapes such as squares, hexagons and rectangles are made in the wire mill.

★ ★ ★

Flat wire, in coils or straight lengths, is also produced. For sizes between 9/16" and 2½", flat stock from the rolling mill is used to make flat wire. This slit stock is edge rolled or scarfed on flat-wire rolls to give the necessary smooth edges and the exact gauge specifications. Flat wire in widths less than 9/16" is rolled from round wire on 2-Hi rolls which resemble small models of the large rolls used in the rolling mill.

★ ★ ★

The production of rod is actually a process of straightening and cutting wire to required lengths. For small sizes of rod, below 5/8" in diameter, the wire is drawn through straighteners and is then

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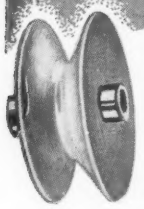

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cut to length. For larger sizes of rod, the wire is first cut to length and then straightened.

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'Difficult to reduce?' Yes, in the sense that refractory copper-base alloys require the most exacting processing techniques. 'Stubborn? Unmanageable?' No, not with the combination of years of experience and know-how and the modern manufacturing methods that are applied at these mills.

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To facilitate the work of preparing the numerous papers that will be presented at the Annual Convention of The Wire Association for publication in **WIRE AND WIRE PRODUCTS**, will you please be sure to send us a copy of your paper complete with illustrations, your photograph and business biography, on or before July 1st.

* * *

Many of the Convention papers will be pre-printed in the October issue and, to enable us to make the proper selections and prepare them for publication, your kind cooperation is needed. May we count on it? Many thanks.

The Editor.

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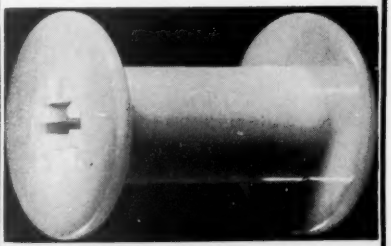

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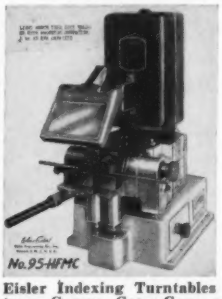

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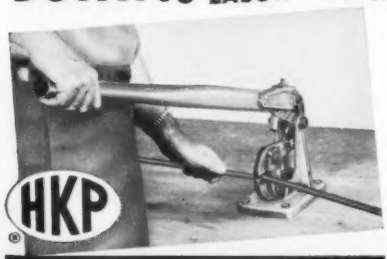

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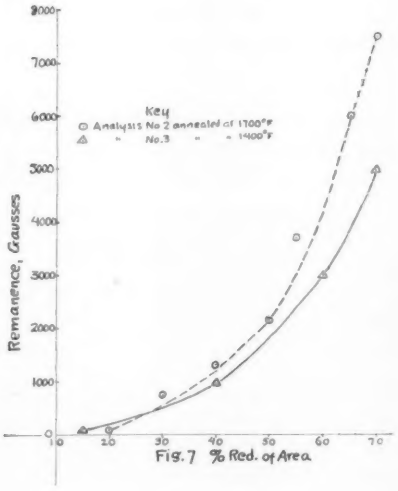
Effect of Prior Anneal Temperature on 18/8 Wires

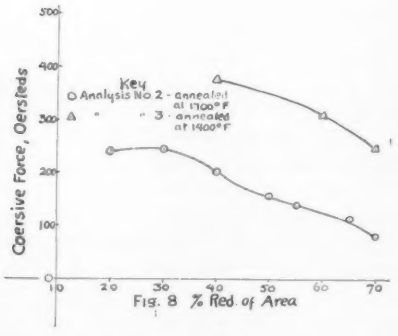
(*Continued from page 643*)

differently by saying: it is possible to obtain, for wires of the same analysis and percent cold reduction, greater remanence and lesser coersive forces the lower the prior anneal temperature.

★ ★ ★

In order to observe what effect chemical analysis had upon the phenomenon discussed above, curves for #2 and #3 analysis were plotted consisting of remanence and coersive force versus percent reducton of area. Analysis #2 curve represents wire annealed at 1700°F while the curve of analysis #4 represents wire annealed at 1400°F., see Figs. 7 and 8.





The fact that in both figures the curves are displaced from each other shows that a definite effect exists. We have learned that lower prior anneal temperature and finer grain sizes, cause wires of the same analysis and percent reduction, a

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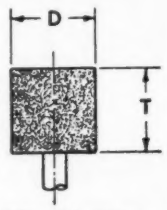

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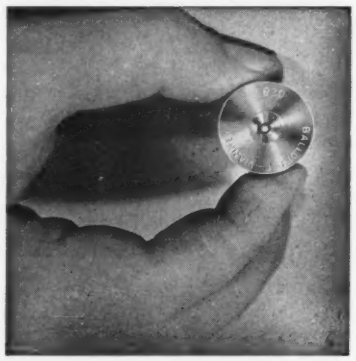

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greater remanence and a lower coersive force to exist. In the analyses compared, the wire annealed at the higher temperature, 1700°F, would, if from the same analysis, exhibit lower remanence values and higher coersive forces than for the wire annealed at 1400°F. However, for the curves presented, the reverse is true. The only difference between the two curves of both figures is that the specimens tested for each curve came from lots of wire of different analyses; specifically, the 1700°F annealed specimens from analysis 2 and the 1400°F annealed specimens from analysis 3. From the initial discussion in the beginning of this article it was stated that nickel inhibited the formation of the magnetic phase. Thus it was projected that wire of analysis 2 should exhibit higher Br values than wire of analysis 3, this purely from a chemical composition viewpoint. Fig. 7 bore this deduction out in spite of the fact that prior anneal temperatures were so chosen as to surpress the effect anticipated and yet did not do it.

* * *

It was learned previously that coersive force declined as remanence increased, see Fig. 3. This indicated that wires of analysis 2 showing higher remanence values than that of analysis 3 should show lower coersive force values. Fig. 8 substantiated this. Again the prior anneal temperatures chosen were such as to exhibit this effect. However, the chemical composition had such a strong influence upon the magnetic properties of 18/8 that the effect could not be surpressed by prior anneal temperature variations.

Acknowledgment

The author should like to acknowledge the kind permission of the **Wilbur B. Driver Co.** for allowing the use of the data presented.

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1. S. Storchheim "Permanent Magnetic Properties in 18/8 Obtained by Cold Working" Iron Age Feb. 12, 1953
2. S. Storchheim "How Heat Treatment Affects Properties of Cold Worked 18/8 Wire" Iron Age Oct. 1, 1953

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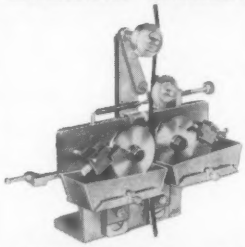

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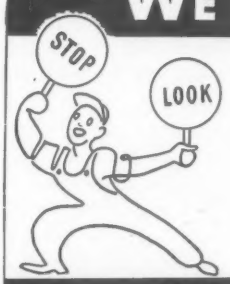

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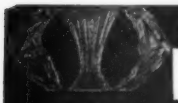
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Computing of Picks per Inch and Ends per Carrier for Braided Cable Shields

(*Continued from page 666*)

core-diameter if C_N is held high—that is for a small braid angle. To keep N under or equal to 8 the ends-constant must be adjusted or in other words the braid-angle increased.

Conclusion

The picks per inch of a shield and the number of ends per carrier will be computed with the two formulas:

$$P = \frac{C_P}{D+2d} \quad (1b)$$

$$N = \frac{D+2d}{d} \times C_N \quad (3a)$$

and with the help of graphs Fig. 1a and Fig. 1c.

★ ★ ★

The braid-angle of a shield is found from graph Fig. 1b by figuring first the coverage-constant C_F with

$$C_P = P(D+2d) \quad (1c)$$

★ ★ ★

The coverage of a braided shield is found from graph Fig. 2 by getting F with

$$F = Nd\frac{C_F}{D+2d} \quad (2c \& 1b)$$

★ ★ ★

The choice of the braid angle depends on the core-diameter and should be kept as low as practically possible to have the desired easy "pushback" of the shield whereby it is recommended to hold P above 10 picks per inch and N below 8 ends per carrier.

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The Extrusion of "Teflon" 6 Tetrafluorethylene Resin for Wire Insulation

(*Continued from page 651*)

ferred to as paste extrusion, for insulating wire with "Teflon" was to determine the effect of each of the operating variables on the quality of the wire insulation. The die design, guide tip clearance, and the oven temperatures were found to be the most critical variables. For optimum machine performance the ram displacement rate and the wire speed should be controlled as accurately as possible.

★ ★ ★

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Molina-Straus Diamond Products Co., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Metallurgical Products Dept. of General Electric Co., Detroit
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Cold Heading
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit
Vascoloy-Ramet Corp., Waukegan, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Ft. Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Ft. Wayne Wire Die Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES DIAMOND—Drawing Angle Controlled
Hoosier Wire Die, Inc., Ft. Wayne, Ind.

DIES DIAMOND—Reversible
National Wire Die Co., New York, N. Y.

DIES—Extrusion
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Kelloy Corporation, New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Polishing, Asbestos Wire
Beard Machine Co., York, Pa.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
Metallurgical Products Dept. of General Electric Co., Detroit
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Hoosier Wire Die., Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Metallurgical Products Dept. of General Electric Co., Detroit
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRIVES—Electric, Adustable Speed
Allis, The Louis Co., Milwaukee, Wis.

DRUMS—Wire Packaging
Continental Can Company, Van Wert, Ohio
Hubbard Spool Company, Garrett, Ind.

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Co., Garrett, Ind.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio

DRYING EQUIPMENT—
Carl Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

ENGINEERS—Consulting
Bartell Machine-Tool Corporation, Rome, N. Y.
Wire Mill—Clarence S. Arms, Worcester, Mass.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FREQUENCY CHANGERS—
The Louis Allis Company, Milwaukee, Wisc.

FURNACES—Brazing
Ajax Electric Company, Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio

FURNACES—Galvanizing Equipment
Ajax Electric Company, Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Company, Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Company, Philadelphia, Pa.

FURNACES—Resisting Heating, Strand
Electric Furnace Company, Salem, Ohio

FURNACES—Salt Bath
Ajax Electric Company, Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio

FURNACES—Strand Annealing
Electric Furnace Company, Salem, Ohio

GAUGES—Wire Diameter, Continuous
Industrial Gauges Corporation, West Englewood, N. J.

GALVANIZING EQUIPMENT—(See MACHINERY—Galvanizing Wire)

GEARMOTORS—
The Louis Allis Company, Milwaukee, Wisc.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Aikali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INKS—Printing, for Insulated Wire
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.

INSULATING MATERIALS—
Bakelite Company Div. of Union Carbon & Carbide Corp., New York, N. Y.
duPont de Nemours Co., (Inc.), E. I., Polychemical Dept., Wilmington, Delaware
General Electric Company, Alkanex Wire Enamel Dept., Schenectady, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Plymouth Cordage Company, Plymouth, Mass.
Shawinigan Resins Corporation, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Products Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

INSULATING MATERIALS—Paper (For Electric Wire Cable)
Plymouth Cordage Company, Plymouth, Mass.

LACQUERING SYSTEMS—See MACH.—Lacquering Electric Wire

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N.Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Company, Harrison, N. J.
Rome Soap Mfg. Co., Rome, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
Tri-State Industrial Lubricants, Morton Grove, Illinois.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen, Wurtt, Germany

MACHINERY—Bobbin Winders
Cedar West Tool Company, Inc., New York, N. Y.

MACHINERY—Braiding
New England Butt Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Capstans and Machinery—Winding Wire)

MACHINERY—Centerless Grinding & Polishing
American Laubscher Corporation, New York, N. Y.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., Shelton, Conn.
Wafios Maschinenfabrik, Reutlingen, Wurtt, Germany

MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Morgardshammer Mek Verstads A. B., Morgardshammer, Sweden.
National Mach'y Exch (Used), New York
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Metallurgical Products Dept. of General Electric Co., Detroit
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven, Company, Detroit, Mich.

MACHINERY—Extruding
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.

MACHINERY—Flat Wire
Fenn Manufacturing Co., Newington, Conn.
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Forming Wire
Nilson, A. H. Machine Co., Shelton, Conn.
Wafios Maschinenfabrik, Reutlingen, Wurtt, Germany

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Mfg. Co., Wallingford, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Beard Machine Co., York, Pa.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Labeling Electric Wire
Dewyer, Inc., Libertyville, Ill.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.
Michigan Oven Company, Detroit, Mich.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Cedar West Tool Company, Inc., New York, N. Y.
E. V. G., Richard Kleinhans, New York, N. Y.
Maschinen & Stahl A. G., c/o Richard Kleinhans, Zurich, Switzerland
Wafios Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Durant Mfg Co., Milwaukee, Wis.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.

MACHINERY—Pin Making

MACHINERY—Plating
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York,
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Polishing Asbestos Wire
Beard Machine Co., York, Pa.

MACHINERY—Printing on Electric Wire
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M. Co., Inc., Boylston, Mass.

MACHINERY—Re-Spooling
Bartell Machine-Tool Corporation, Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Emory, Robert J., Co., Newark, N. J.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
National Mach'y Exch. (Used), New York N. Y.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

MACHINERY—Rod Mill
Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill
Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Staple
Nilson, A. H. Machine Co., Shelton, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Straightening & Cutting
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Patterson Machine, Geo. C., Co., Cleveland, Ohio

MACHINERY—Stranding
Bartell Machine-Tool Corporation, Rome, N. Y.
Godderidge Ste., Houilles, (Seine-et-Oise), France
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Stripping Electric Wire & Cable
Burdwood, Howard A., Inc., Portland, Maine

MACHINERY—Swaging
Fenn Manufacturing Co., Newington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
American Insulating Mach'y Co., Phila., Pa.
Colbourne Machine Company, Winsted, Conn.
Davis-Standard Division of Franklin Research Corporation, Mystic, Conn.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Fenn Manufacturing Co., Newington, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio
Pourtier Pere et Fils, Romainville (Seine) France
Standard Mill Supply Co., Pawtucket, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Federal Mfg. Co., Wallingford, Conn.
Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Bartell Machine-Tool Corporation, Rome, N. Y.
Cook Manufacturing Co., The, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Turks Head
Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—Welded Wire Mesh
E. V. G., Richard Kleinhans, New York, N. Y.
Maschinen & Stahl A. G., c/o Richard Kleinhans, Zurich, Switzerland

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot and Machinery —Welding Wire Fabrics)

MACHINERY—Winding Wire
Emory, Robert J., Newark, N. J.
Federal Manufacturing Company, Wallingford, Conn.
Fenn Manufacturing Co., Newington, Conn.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Federal Mfg. Co., Wallingford, Conn.
Fenn Mfg. Co., Newington, Conn.
Herborn, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
Morgardshammer Mek Verstads AB, Morgardshammer, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Forming
National Mach'y Exch. (Used), New York, N. Y.
Nilson, A. H. Machine Co., Shelton, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Wrapping with Paper
Larmuth (1947) Ltd., Swinton, England
Terkelsen Machine Co., Boston, Mass.

MANDRELS—Extrusion
Bartell Machine-Tool Corporation, Rome, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MOTORS—Electric, A.C. & D.C.
The Louis Allis Company, Milwaukee, Wisc.

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Company, Winsted, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio
Michigan Oven Company, Detroit, Mich.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Litzler, C. A., Co., Inc., Cleveland, Ohio

PAILS—Packaging
(See Drums—Wire Packaging)

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAPER—Creped Wrapping
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Rinkle, Krinkle Paper Co., Inc., Boston, Mass.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Rinkle, Krinkle Paper Co., Inc., Boston, Mass.
Terkelsen Machine Co., Boston, Mass.

PAPER—Insulating
Plymouth Cordage Company, Plymouth, Mass.

PATENT—ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PLASTICIZERS—
Monsanto Chemical Company, Plastics Division, St. Louis, Mo.
Pittsburgh Coke & Chemical Co., Pittsburgh, Pa.

PLASTICS COMPOUNDING—Custom
Plandex Corporation, Downingtown, Pa.

PLASTICS—for Wire Insulation
Bakelite Company Div. of Union Carbon & Carbide Corporation, New York, N. Y.
duPont de Nemours Co., (Inc.), E. I., Polychemical Dept., Wilmington, Delaware
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Plandex Corporation, Downingtown, Pa.
Shawinigan Resins Corporation, Springfield, Mass.
U. S. Industrial Chemicals Company, Division of National Distillers & Chemical Products Corporation, New York, N. Y.
United States Rubber Company, Naugatuck Chemical Division, New York, N. Y.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

PRINTING WHEELS—for Electric Wire
Entwistle Manufacturing Corporation, Providence, R. I.
Gillies, Duncan M. Co., Inc. Boylston, Mass.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

PUMPS—Molten Metal
Fisher Associates, New York, N. Y.

RACKS—Wire Storage
Jarke Manufacturing Co., Chicago, Illinois

REEL AND TENSION STANDS—
Industrial Ovens, Inc., Cleveland, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company The, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company The, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Masonware Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company The, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Masonware Company, East Providence, R. I.
McCaskie, Inc., William, Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Nilson, A. H. Machine Co., Shelton, Conn.
Republic Steel Corp., Pressed Steel Div., Cleveland, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., William, Westport, Mass.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Aluminum
Aluminum Company of America, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Aluminum Company of America, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Phosphor Bronze Div., Seymour, Conn.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—Braider, Wire
Plastic Mold & Engineering Co., Providence, R. I.

SPOOLS—Plastic
Hubbard Spool Company, Garrett, Indiana
Standard Mill Supply, Co., Pawtucket, R. I.

SPOOLS—Stamped Metal for Retail Wire Sales
Masonware Company, East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STOCK STORAGE SYSTEMS
Jarke Manufacturing Co., Chicago, Illinois

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

TABLES—Press Feeding
Jarke Manufacturing Co., Chicago, Illinois

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TESTERS—INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TOOLS—Wire Cutting
Porter, H. K., Inc., Somerville, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Adjustable Speed Drives)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Bartell Machine-Tool Corporation, Rome, N. Y.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VARNISHES & LACQUERS—for Electric Wire
General Electric Company, Alkanex Wire Enamel Dept., Schenectady, N. Y.
Shawinigan Resins Corporation, Springfield, Mass.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila, Pa.
Litzler, C. A., Co., Inc., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
Micro Products Co., Chicago, Ill.
Strecker, August, K.G., Limburg/Lahn, W. Germany

WHEELS—for Printing on Electric Wire
Gem Gravure Company, West Hanover, Mass.

WIRE—Aluminum
Aluminum Company of America, Pittsburgh, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Scovill Mfg. Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Ball
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass and Bronze
Chase Brass & Copper Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Company, Phosphor Bronze Div., Seymour, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Cadmium
Stamford Processing Co., Peekskill, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Chase Brass & Copper Co., Waterbury, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—For Electrical Conductors
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Flat, Fine
Montgomery Co., The, Windsor Locks, Conn.
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
National Standard Company, Niles, Mich.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—High Carbon
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Manufacturers
Aluminum Company of America, Pittsburgh, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Riverside-Alloy Metal Div., H. K. Porter Company, Inc., Prospect Park, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Company, Phosphor Bronze Div., Seymour, Conn.
Sheffield Steel Corp., Kansas City, Mo.
United Wire & Supply Corporation, Providence, R. I.
U. S. Steel Corp., N. Y., N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Metalizing
Stamford Processing Co., Peekskill, N. Y.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Worcester Wire Works Div., National-Standard Company, Worcester, Mass.

WIRE—Needle
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Alloy
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio
Riverside-Alloy Metal Div., H. K. Porter Company, Inc., Prospect Park, Pa.
Seymour Mfg. Co., Phosphor Bronze Div., Seymour, Conn.
United Wire & Supply Corporation, Providence, R. I.

WIRE—Oil Tempered
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Special Shapes
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Riverside-Alloy Metal Div., H. K. Porter Company, Inc., Prospect Park, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Riverside-Alloy Metal Div., H. K. Porter Company, Inc., Prospect Park, Pa.
Roebling's John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
United Wire & Supply Corporation, Providence, R. I.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Steel—Also Coppered and Galvanized Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Crucible Steel Co. of America, Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
Johnson Steel & Wire Co., Inc., Worcester Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Riverside-Alloy Metal Div., H. K. Porter Company, Inc., Prospect Park, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
United Wire & Supply Corporation, Providence, R. I.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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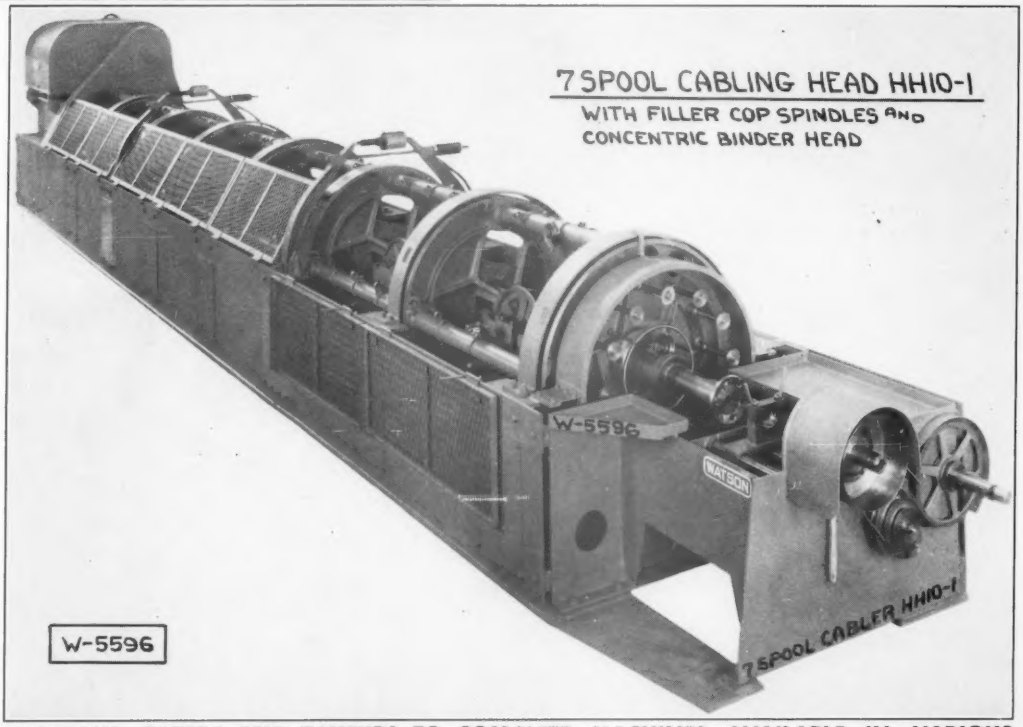

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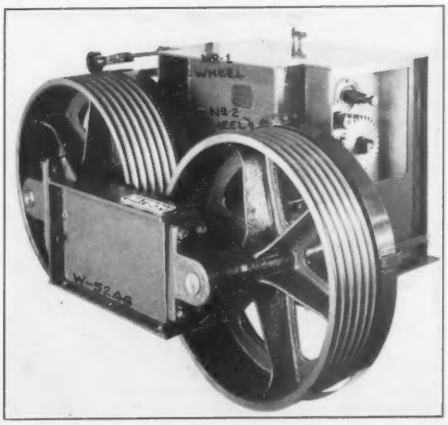

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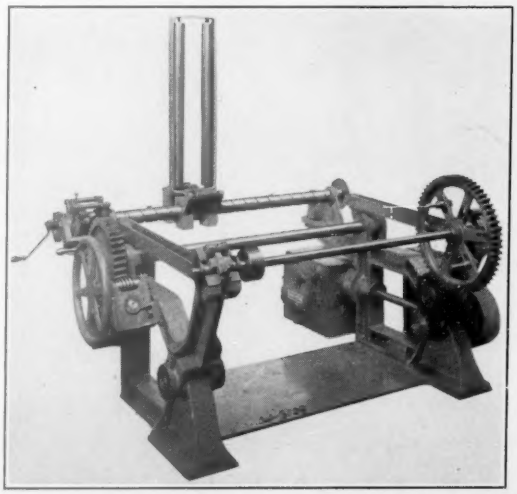

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- SINTERING
- SOLUTION TREATING
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- STRESS RELIEVING

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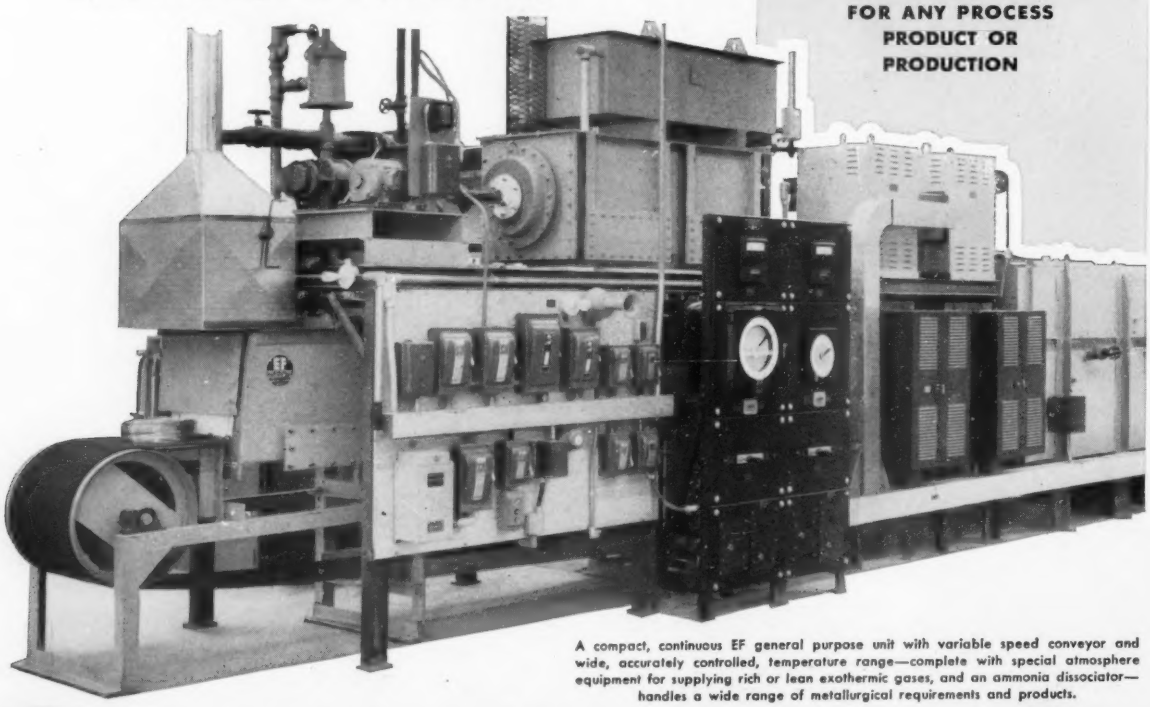

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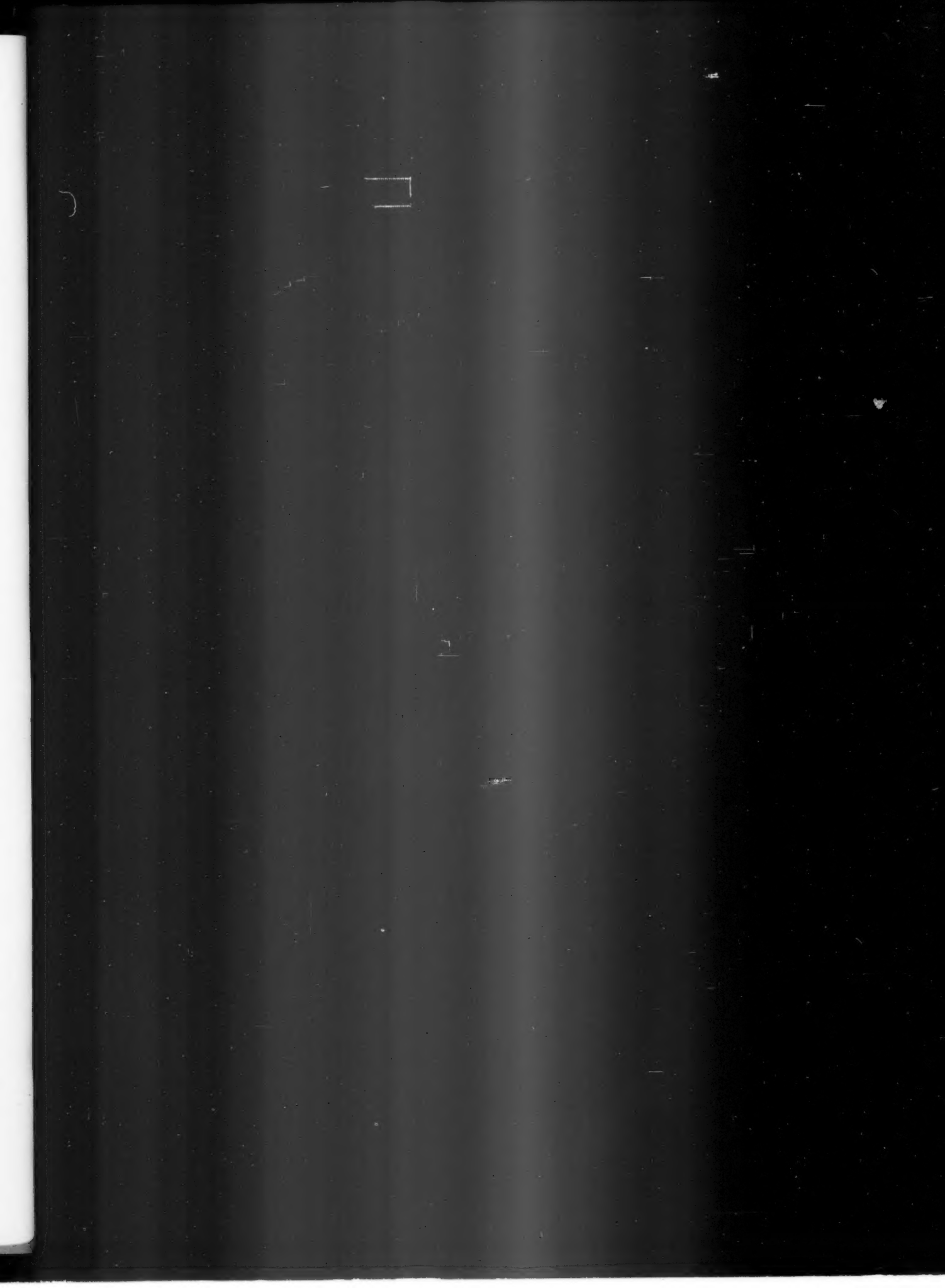
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